15 January 1993 Final

FUNCTIONAL ECONOMIC ANALYSIS GUIDEBOOK, Version 1.1

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Functional Economic Analysis is an evolving methodology. It will change as new techniques and tools are developed and as experience is gained in applying the methodology. This Guidebook showns how to prepare an FEA through practical examples and illustrations that are consistent with OSD policy. Also, this Guidebook shows that FEA is most effectively done in conjunction with functional process improvement analysis.

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Functional Economic Analysis, FEA; Guidebook; Functional Process Improvment; FPI, Business Process Improvement, BPI (CIM Collection) 156

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Corporate Information Management

Functional Economic Analysis Guidebook

Version 1.1

15 January 1993

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FOREWORD

Functional Economic Analysis (FEA) is a management tool to determine and document the costs and benefits of functional process improvements and related investments in information technology. DoD Directive 8C00.1 establishes policy and assigns responsibilities for completing FEAs. Draft DoD 8020.1-M indicates that FEAs are required whenever process improvement decisions require new or changed data elements, or additional investment expenditures for information technology. The guidance states that these decisions "*shall be supported by quantitative data produced through functional economic analyses which demonstrate that the risk-adjusted benefits clearly outweigh the costs of making process changes.*"

Since FEA is a new DoD methodology, implementation is being done on a phased basis as outlined in the ASD (C3I) memorandum of 22 October 1992. Specifically, this memorandum calls for FEAs from a limited number of OSD organizations, but notes that this type of analysis will eventually be required of all OSD organizations.

Development of this Guidebook represents a major milestone in our effort to assist functional managers in streamlining business methods to achieve the Department's aggressive savings targets established by the Defense Management Report. The Guidebook shows how to prepare an FEA through practical examples and illustrations that are consistent with OSD policy. The Guidebook also shows that FEA is most effectively done in conjunction with functional process improvement analysis. While portions of the Guidebook are aimed at meeting OSD decision reporting requirements, functional managers at every level of DoD should find the Guidebook useful in meeting their responsibilities to justify their local technology investments.

FEA is an evolving methodology. It will change as new techniques and tools are developed and as experience is gained in applying the methodology. As these changes occur, both the policy and Guidebook will be refined and updated through a coordinated effort with the appropriate OSD organizations. Every effort will be made to minimize the impact of these changes on the functional community. To facilitate this process, a comment form has been incorporated into this Guidebook.

I challenge each functional manager who is involved in making investment decisions to understand and apply this guide, remain current with our implementation plans, and integrate their own business process improvement initiatives with those of the Department.

Paul A. Strassmann

Paul A. Strassmann
Director of Defense Information, ASD (C3I)

INTRODUCTION

The 1990s are challenging times for the Department of Defense. Major changes in the military threat to U.S. security interests have significantly altered defense requirements, and corresponding reductions in DoD resources are required. Senior officials in the Department are committed to achieving those savings by improving the efficiency of DoD business processes. Corporate Information Management (corporate IM, or CIM) is the major strategic initiative supporting this goal.

Functional Economic Analysis is an integral part of the CIM strategy to facilitate process improvement within DoD. Official guidance describing *what* FEA is and its role in the Functional Process Improvement (FPI) program is found in DoD 8020.1-M, *Functional Process Improvement*. The purpose of this Guidebook is to show you *how* to perform Functional Economic Analysis consistent with the official guidance. In that role, this book is similar to *Process Improvement Methodology for the DoD Functional Manager*, which describes how to perform the initial steps of the FPI program, activity and data modeling.

This Guidebook will help you understand how to make the case for information technology investments under the corporate IM program. Along the way, we hope to convince you that FEA is a useful discipline for evaluating *any* type of investment within DoD. As a byproduct, FEA provides essential information, not currently available, that DoD managers can use in improving the way they perform their functional activities.

FEA is an evolving methodology. Similarly, this Guidebook will change as new techniques for performing FEA are developed, as new tools supporting FEA become available, and as experience with this Guidebook indicates better ways to describe FEA concepts and processes. Please contact the DDI Hotline (1-800-TELL CIM) to make sure that your copy of the Guidebook is the most recent version available.

Version 1.1 of the Guidebook is meant to be used with Version 2.3 of the FEA Model

Functional
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MODULE 1:

What is FEA?

1.1 Module Objectives

This module introduces the concept of Functional Economic Analysis (FEA). As background, it outlines the Functional Process Improvement (FPI) cycle and describes the important roles that FEA plays within the FPI program.[1] This module also presents the central principles that form the foundation for FEA and describes the organization of the Guidebook.

At the end of the module, you will be able to:

- Explain the rationale for Functional Economic Analysis within CIM.
- Describe the principles of FEA.

Key Terms in This Module

A list of key terms appears at the beginning of each module. These terms are defined in the Glossary in Appendix A of this book. The terms for Module 1 are:

Corporate Information Management
Functional Economic Analysis
Functional Process Improvement

[1] FPI is also known as "Business Process Improvement."

1.2 Functional Process Improvement and FEA

One of the goals of corporate Information Management (IM) is to help the Department meet the budget reduction targets established by the Defense Management Review (DMR). A central CIM strategy is to facilitate *cost-effective* improvements in the way DoD performs its functions. To support this strategy, DoD has developed the Functional Process Improvement program, a structured approach for identifying, evaluating, and implementing improvements to current Department processes.

Functional Process Improvement Cycle

Figure 1-1 displays the major steps in the FPI cycle, as presented in DoD Instruction 8020.1-M, *Functional Process Improvement*. To show the context of FEA, we briefly describe these steps, starting with **Define**.

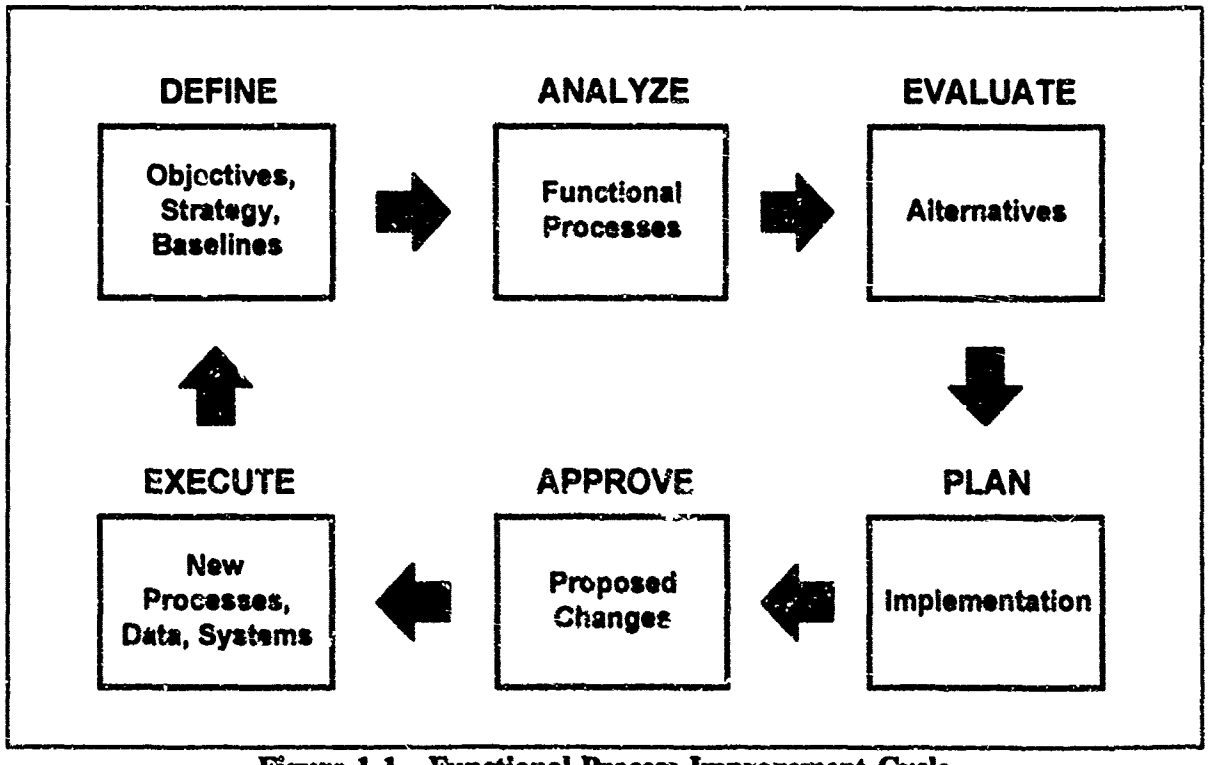

Figure 1-1. Functional Process Improvement Cycle

Define. To establish the framework for the FPI effort, the cycle begins by defining the baselines, objectives, and strategies for the function.[2] Baselines describe where the function is now, in terms of processes, costs, performance measures, automated information system (AIS) inventories, and other attributes. Knowing where the function is now is a necessary prerequisite to determining where it should go, which is specified in the function's objectives. Strategies describe, in general terms, how the function will get from its baseline to its objectives. Baselines, objectives, and strategies are also known collectively as functional direction.

Analyze. With the FPI framework developed, the work of analyzing current processes to identify potential improvement opportunities begins.[3] Activity and cost models, such as the IDEF0 and Activity Based Costing (ABC) techniques chosen by CIM, are used in both the **Define** and **Analyze** steps. They provide a structured approach for documenting current processes and understanding how improvements to those processes might work. Ideas for improvement opportunities can come from a variety of sources, including an assessment of current obstacles to meeting the function's objectives, surveys of best business practices relevant to the function, the analysis of data sources and information flows, and the process of building activity and cost models.

Evaluate. Functional Economic Analysis is the primary activity in the third FPI step. Here improvement opportunities, which describe *what* should be changed, are turned into initiatives by considering *how* the improvement opportunities should be implemented. Initiatives are then packaged into alternatives, each of which describes a possible plan for moving the function to its objectives. With the alternatives defined, FEA proceeds with an evaluation of the alternatives, constructing financial and nonfinancial measures of merit to help the functional manager determine the best course to follow.

Plan, Approve, and Execute. With a promising alternative selected, the more detailed planning required to implement the alternative is performed. Then, approval of the proposed changes is obtained, and the changes are executed.

Note that FPI is an iterative process. After one round of changes is under way, the search for more improvements begins again.

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[2] Function refers to a functional area under the direction of an OSD Principal Staff Assistant (PSA) or the area's subordinate functional activities.

[3] A process is a chain of tasks or activities that produce a common product, and may cross organizational boundaries.

FEA: Process and Document

FEA plays two roles within the FPI program. As a process, FEA uses and interprets the data needed by functional managers to choose the best alternative—the **Evaluate** step. The primary focus of this process is the comparison of baseline and alternative costs using the techniques of economic analysis.

As a document, *the* FEA is an essential part of the **Approve** step. It presents the case for investments in DoD process changes by collecting information relevant to the decision and displaying that information in standard formats.

Figure 1-2 shows the sections of the FEA, as required by DoD 8020.1-M. Note that the FEA document includes more than just the results of the cost analysis completed as part of the FEA process. It also summarizes strategic plans for the functional area and activity, reports on performance measures and targets, describes the functional improvement program, and outlines the supporting data management and information systems changes required by the improvement program. The FEA document is designed to "carry" all the information needed to make good business decisions.

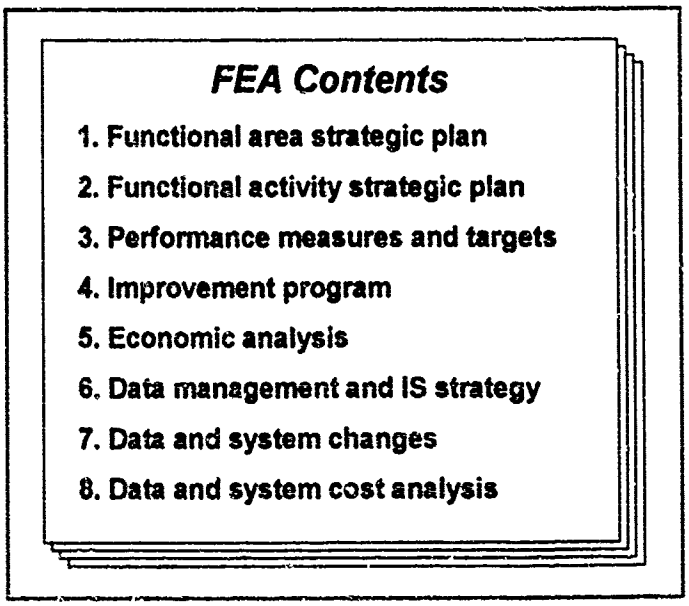

Figure 1-2. Sections of the FEA Document

1.3 FEA Principles

Three general principles have guided the development of the FEA methodology presented in this Guidebook. These principles help to define what "good" functional economic analysis is and show its usefulness in managing functional activities.

Functional Focus. Although the Director of Defense Information (DDI) has introduced FEA to the Department, Functional Economic Analysis focuses on evaluating changes to functional processes, not information systems. FEA is designed to provide the manager with the bottom-line understanding needed to use all types of resources effectively in meeting DoD objectives. In the case of information technology, this focus is necessary to assure that AIS investments are selected because of the benefits they will deliver to DoD functions, not solely because of technological considerations.

The functional focus of FEA carries through to the assignment of responsibility for preparing and approving FEAs. It is the functional manager of a DoD activity who makes the substantive decisions in preparing an FEA, such as selecting the particular alternatives to be evaluated. It is the Principal Staff Assistant who approves the changes recommended in the decision package. The role of the DDI in FEA is to ensure that the critical issues are addressed by the methodology.

Measurement. The FEA methodology requires measurement of key attributes of functional processes, such as costs and outputs. For the functional manager, quantitative measures are important in assessing the current state of the function, in setting substantive objectives, in evaluating alternative ways to achieve those objectives, and in gauging progress toward the objectives.

Currently, DoD managers often have to make important decisions with less information than should be available to them. For example, financial systems designed principally to allocate budgets and track expenditures at a corporate level don't provide the information needed to understand how costs are generated. This information needs to be captured for the functional manager to develop and implement cost-effective changes in his or her function.

Management Tool. The FEA is designed to be an ongoing management tool, not a one-time reporting requirement. As shown in Figure 1-3, the FEA can support the functional manager in responding more quickly, and consistently, to analyses required for the existing acquisition and programming/budgeting processes. For acquisition support, the FEA shows both the costs and benefits of planned investments. For programming/budgeting support, the FEA shows projected function costs by fiscal year. The FEA also provides the management information, such as performance measures, needed to monitor progress toward functional process improvement objectives within the functional plan.

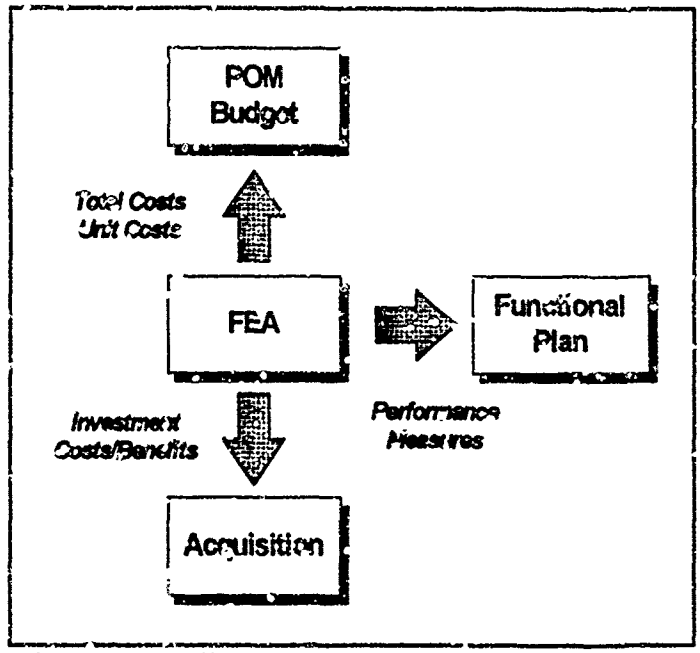

Figure 1-3. FEA—A Multi-use Management Tool

1.4 A Look Ahead

To provide a roadmap for the reader, the material presented in this *FEA Guidebook* follows the steps of the FPI cycle.

Module 2 describes the products of the **Define** step that are needed to do FEA, including the elements of functional direction, performance measures, functional baselines, and activity costs.

Module 3 describes the important concepts in the **Analyze** step, including improvement opportunities, initiatives, action plans, and alternatives. In both Modules 2 and 3, our emphasis is on showing *what* is required for FEA, not describing *how* to conduct the analysis in the steps leading up to FEA. However, we do refer to other documents that should be helpful in performing the **Define** and **Analyze** steps and include some introductory "how-to" material to assist in getting started.

Module 4 shows how to perform the economic analysis that is the centerpiece of the **Evaluate** step. It describes how to prepare cost information for use in the FEA Model, introduces the concepts of discounting and risk, and provides guidelines for interpreting the results of the economic analysis. It also shows how nonfinancial measures of merit can be incorporated into the choice of an alternative.

Module 5 describes what should be included in an FEA decision package and outlines the process for approving proposals made in that package.

Module 6 introduces "life after the FEA." In particular, it describes how information in the FEA can be used to monitor and manage the approved changes.

To help illustrate FEA concepts, we have created a sample FEA. The scenario, which defines the function and presents the information necessary to perform FEA, is found in Appendix B. You may find it useful to read through the whole scenario before turning to the material in the modules.

The FEA decision package resulting from analysis of the information in the scenario is located in Appendix C. We incorporate relevant portions of the scenario and the FEA document into the modules using shading to distinguish the sample material from the text. For example, the following excerpt from the scenario begins the description of the function:

FEA Example

1. **Introduction.** To begin the Functional Economic Analysis, information from other sources will be required. An assumption in this guideline is that most information will be part of the baseline maintained by the functional manager, not a data call undertaken as part of the FEA process. This appendix describes what these input data could consist of, and provides the specific illustrations to be used for the FEA example document that appears in Appendix C of this Guidebook.

The input material consists of the following items, each of which is addressed in detail in this appendix:

- Functional direction, as established by senior functional managers as input to the analysis.

- The results of a process improvement project. The products of this effort include activity models, improvement opportunities, initiatives, alternatives, and action plans intended to meet the objectives prescribed in the functional direction. This project also identifies the costs and benefits of each alternative.

2. **The Setting.** This scenario is based on a DoD FEA effort, but the presentation is for exposition only. The environment has been simplified, idealized, and extended to illustrate types of situations faced by DoD activities. Readers should concentrate on the information mappings and forms, recognizing that to fully explore a specific function would detract from conveying a way of completing an FEA.

1.5 Questions and Answers

At the end of each module, frequently asked questions will be answered. This section will be updated and extended in future versions of the Guidebook.

Is there any difference between an FEA and a business case?

> The business case process is the same as Functional Economic Analysis. Similarly, the terms Functional Process Improvement and Business Process Improvement are used interchangeably.

At what level of DoD is FEA targeted?

> The Defense IM program has divided DoD into functional *areas*, corresponding to the division of responsibilities among OSD Principal Staff Assistants. Within each area, a number of functional *activities*—mutually exclusive collections of related functional processes—have been identified. FEAs are required for investment decisions proposed for functional activities, but the evaluation methodology used in FEA can also be applied to smaller pieces of DoD.[4]

Who prepares the FEA?

> The FEA methodology is designed for use by the functional manager and his/her staff. DDI is developing a consistent tool set to support the preparation and maintenance of FEAs. In addition, DDI is setting up vehicles to deliver analytical support, both DoD and contractor, for establishing an FEA environment and performing complex cost analysis. Contact the DDI Customer Hotline (1-800-TELL CIM) for the latest information.

Where is the official guidance for FEA?

> DoD 8020.1-M, *Functional Process Improvement*, provides direction for the entire FPI program. Chapter 11 focuses on FEA.

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[4] A complete list of functional areas and functional activities is contained in Appendix D of DoD 8020.1-M, *Functional Process Improvement*.

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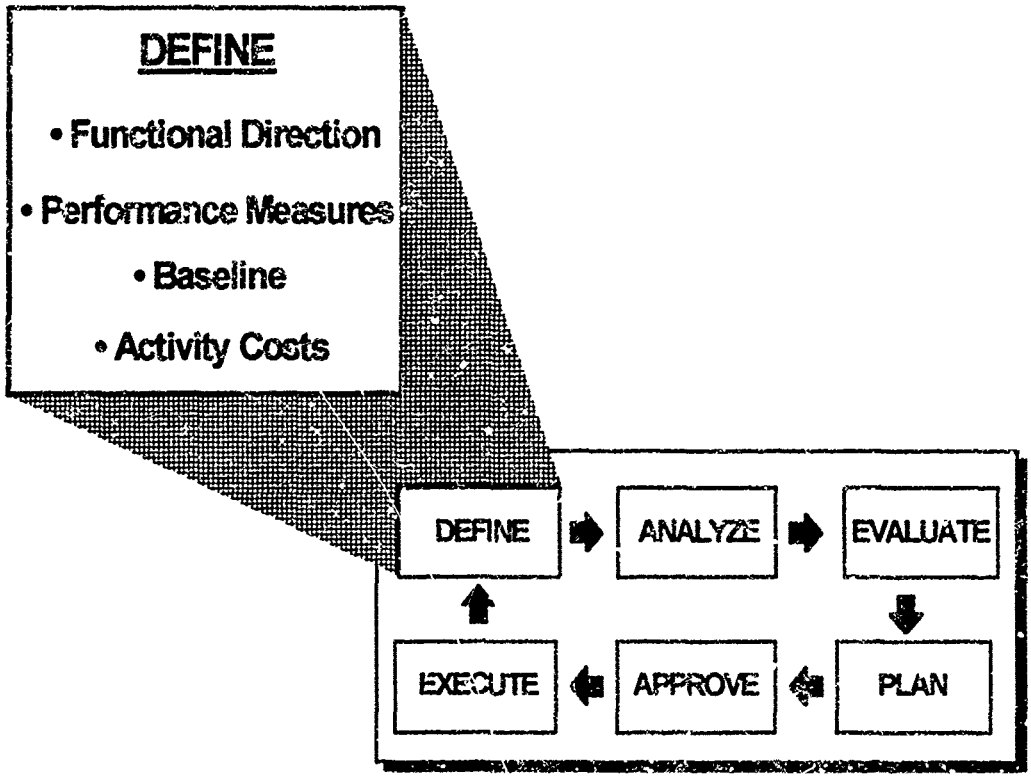
MODULE 2:

Getting Ready for FEA


DEFINE
• Functional Direction
• Performance Measures
• Baseline
• Activity Costs
DEFINE
ANALYZE
EVALUATE
EXECUTE
APPROVE
PLAN

2.1 Module Objectives

This module will help you gather information and prepare for Functional Economic Analysis, with emphasis on understanding the role of a baseline in an FEA. We will also begin using the FEA example presented throughout the book.

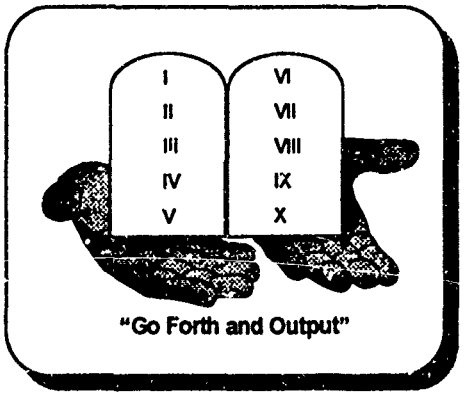
At the completion of this module, you will be able to:

- Explain how functional direction shapes FEA.
- Develop appropriate performance measures and objectives for baseline activities.
- Present baseline activity costs and workloads.

Key Terms in This Module

Activities
Activity cost
Activity output
Baseline
Cost driver
Cost elements
Functional direction
Model
One-time costs
Performance measure
Performance objective
Recurring costs
Unit cost
Workload

2.2 FEA Functional Direction



Preparation of the FEA begins by understanding top management's intentions and goals for the function, i.e., *functional direction.*[1] Functional direction includes long-term objectives, measures and targets for assessing achievement toward these objectives, and strategies for meeting these objectives.

Functional objectives provide a framework for accomplishing missions and conducting ongoing operations. This framework links missions and operations to strategic direction and joint war fighting requirements, as well as to planned improvements in peacetime effectiveness and efficiency. These objectives support a top-down, long range view (10+ years) of the function, but also focus on near-term operational goals, including priorities for process improvement for the next six-year period.

Top management identifies *performance measures* for functional objectives and the function's primary outputs. These performance measures are quantified during analysis for the AS-IS process and for each alternative. When approved, the alternative values become functional performance targets and provide a verifiable basis for assessing progress toward achieving the objectives.

Strategic plans document top management's approach to these objectives. Functional management strategy reflects the Principal Staff Assistant's decision on the scope of process standardization within the function that will be carried out across DoD. The strategic plans also reflect available resources that are budgeted or projected through the planning horizon. The strategy also addresses: how major DoD initiatives (e.g., corporate IM) will influence achieving these functional objectives, crucial events or considerations (critical success factors), and decisions regarding the life-cycle of existing information systems and information resources (e.g., existing systems picked for migration, or transformation, to the corporate IM technical environment).

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[1] Function refers to a functional area under the direction of an OSD Principal Staff Assistant (PSA) or one of the area's subordinate functional activities, each under the direction of a functional proponent or functional manager.

FEA Example

3. Functional Direction. The OSD Principal Staff Assistant (PSA) directed that a functional economic analysis be developed for the functional activity of supply. The PSA provided guidance for the functional area of supply to the functional manager, who developed this guidance in greater detail in order to produce functional direction for the functional activity. Functional direction, summarized in Figures B-1 through B-5, has been extracted from the functional area and functional activity strategic plans to serve as the basis for process improvement analysis and planning.

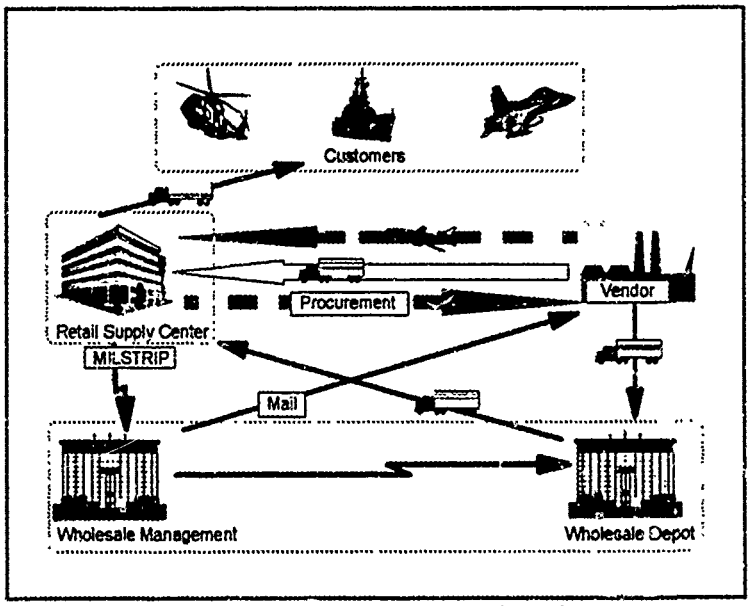

Figure B-1. Functional Direction Current Business Practices

Figure B-1 describes the current functional process. This current state of operations is characterized by paper information exchange using the mail system, and by the fact that many retail supply centers initiate procurement actions with individual vendors.

Figure B-2 portrays the TO-BE strategic vision for the functional activity. This future process is characterized by extensive use of electronic data interchange (EDI) throughout the system, by greater reliance on direct shipments to customers, and by major consolidation of procurement actions.

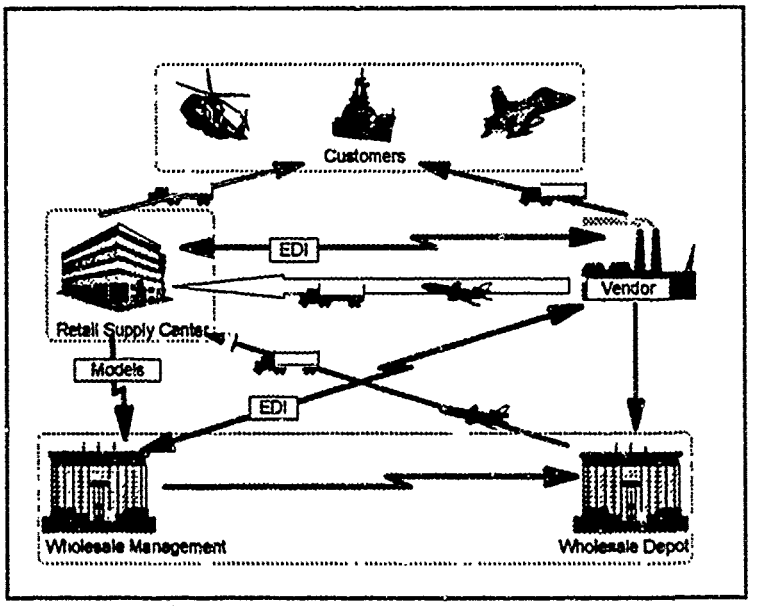

Figure B-2. Functional Direction TO-BE Vision

General Guidance

Apply corporate IM principles in developing process improvements.

Current Funding ($ millions) *

	FY94	FY95	FY96	FY97	FY98	FY99
DBOF	2,943	2,890	2,840	2,750	2,700	2,600

* These figures reflect the impact of DMRD-imposed reductions.

Current Unit Cost

Cost per Dollar of Sales $ 0.75

Workload Projection (sales -- $ millions)

FY94	FY95	FY96	FY97	FY98	FY99
3,924	3,856	3,793	3,730	3.667	3,604

Figure B-3. Functional Direction Cost and Workload Data

Figure B-3 provides overall direction. The guidance includes:

- Corporate information management (IM) principles. Supply supports a wide variety of DoD functions. Application of corporate IM principles will ensure that it is fully integrated and contributes to the effectiveness and efficiency of future DoD missions.

- Dollar funding information. This shows the current funded level for the functional activity. This data is labeled "DBOF" because supply is one of the functional activities that is funded through the Defense Business Operations Fund. This stream of dollars represents customer funding projected for supply, based on data contained in the most recent Future Years Defense Program

(FYDP) information. The Defense Management Review Decisions (DMRDs) that affect the functional activity have already been removed.

- Unit cost. This is the current unit cost for the functional activity. In the case of supply, the unit cost measure established by the OSD Comptroller is dollars of cost per dollar of sales handled by the system.

- Workload projection. The dollar value of sales processed by the supply system is projected to decrease each year.

Figure B-4 describes the performance measures for the supply functional activity. Historical information shows that direct contracts with suppliers are clearly more economic than either local purchase or warehouse strategies. The graph illustrates the strategy to handle a greater portion of transactions by filling orders directly, and less by relying on local commercial vendors and warehouse stocks. The bottom states the performance measures established for the functional activity. This figure shows the current performance against the measures. A key goal of the supply process improvement effort is to decrease order-ship time and increase direct fill percentage.

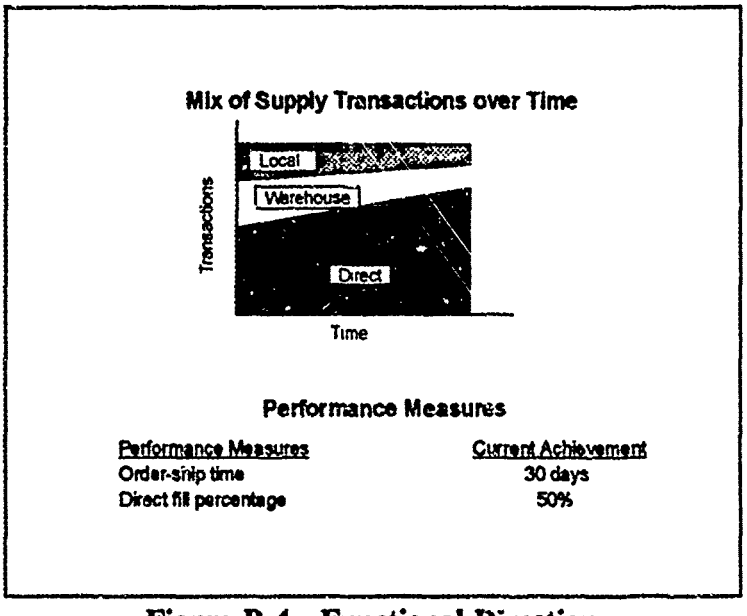

Figure B-4. Functional Direction Performance Measures

Figure B-5 offers the guidance regarding information technology (IT). This guidance is based on the results of several analyses that were done for the functional activity. These analyses determined that of the nine automated information systems (AISs) now in use or planned for development, two were determined to be migration system candidates. These candidate systems are OSD Agency System 898 and MILDEP System 567. Development effort for the other seven AISs is frozen.

System Baseline

Number of AIS in development in all components -- 9

Preliminary System Migration Guidance

Candidates for migration system — OSD Agency System 898; MILDEP System 567

Guidance: Freeze development and modernization on remaining seven AIS.

Strategic Data Guidance

Use data elements identified in high-level study.
Plan for migration to shared data system and mapping of legacy data.
Plan for source data automation.

Figure B-5. Functional Direction Information Technology Guidance

2.3 Performance Measures

Performance measures gauge the ' ..nt, speed, quality, and cost of work done by an activity. In FEA, functional managers ...st understand what triggers a functional activity, what drives the costs it incurs, how the activity consumes resources, and what the activity produces as an output. They must also understand how an activity's resource consumption varies in relation to changes in output. This helps more reliably forecast the resources and capacity needed to cope with future *workloads*. These performance measures become the bases for converting financial accounting information into management accounting information, for estimating benefits, and for year-to-year activity level comparisons. Performance measures also focus the development of process improvements.

Performance measures must be meaningful to and achievable by the functional manager responsible for the activity. This is why a business process analyst typically measures activities at one level differently from their higher-level aggregate activities, i.e., the measures become more abstract at elevated activities. An appropriate measure should encourage the manager to think: "I can affect or improve what is measured." Quantifying these performance measures allows functional managers to establish and monitor *performance objectives*. Yet, these measures and objectives must be harmonious with higher management's viewpoint. Functional managers accomplish this when they set performance measures consistent with strategic goals and objectives. This provides the link between activities and strategic plans at all levels of functional management.[2]

Figure 2-1 shows that top management gives performance measures through goals and objectives contained in strategic plans. Strategic goals, objectives, and critical success factors shape functional direction. Within this direction, functional managers

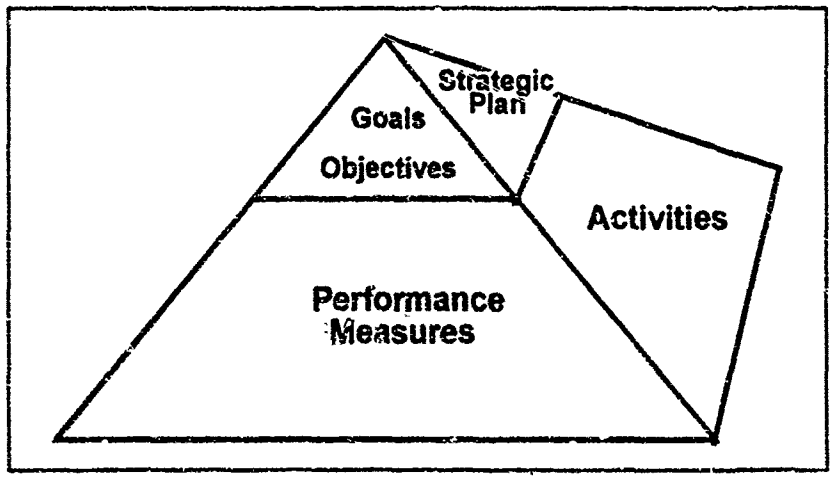

Figure 2-1. Performance Measures Link Activities with Strategic Plans

[2] C. Berliner and J.A. Brimson, *Cost Management for Today's Advanced Manufacturing*. Boston: Harvard Business School Press, 1988.

decide the necessary measures of volume, cost, quality, and speed of work for each activity under their control.[3]

Performance measures must be relevant, measurable or observable, and easy to apply. Performance data should be cost-effective, available, and timely. Please refer to Appendix D for more information on performance measures.

FEA considers activity levels caused by outyear workloads. Typically, workload is expressed as potential activity output,[4] and used to calculate unit cost. However, workload alone does not cause future rises or falls in cost. Changes in efficiency, input cost, and quality standards also influence unit cost. Using performance measures, activity costing establishes the relationships between outputs and resource inputs, and identifies *cost drivers*, or those things that cause an activity to incur costs, e.g., regulatory changes. Some of these relationships behave in a fixed manner, i.e., the expenditure of resources is constant despite the amount of output produced. All other relationships behave variably, i.e., the expenditure of resources rises or falls in some proportion to the volume of output. These relationships provide insight for calculating outyear resource requirements and costs from outyear workloads, because today's cost patterns may not be those in future years.

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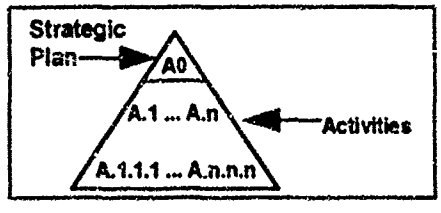
[3] From a functional manager's viewpoint, Figure 2-1 can be shown (using IDEF0 notation) as Activity *A0* (the strategic plan level), and its decomposed activities *(increasingly detailed activities) A.1* through *A.n* and *A.1.1.1* through *A.n.n.n:*



[4] A performance measure assigned to an activity's primary output is also referred to as the *activity measure.*

2.4 What is a Baseline?

A *baseline* is a reference position for measuring progress in process improvement and related cost analyses.[5] Two situations need to be considered: establishing the initial baseline and using an approved baseline from a prior FPI effort.

Initial Baseline

The *initial baseline* is the financial profile of the funds needed to satisfy current and future workloads.

Establishing the Initial Baseline

Prior to undertaking process improvement, the scope has to be defined. This includes the current funding level for the functional activity and the workload estimates over the planning period. The functional analysis and modeling team develops an AS-IS model and determines activity costs which will be used in latter phases. Analysis of the AS-IS model can also establish initial values for functional measures.

The initial financial baseline used in the FEA will be computed for the total functional activity as follows:

- Determine current functional activity funding level and estimated workload. This can be provided as part of the functional direction or be the first step in the analysis and include both functional and AIS costs.
- Determine the unit cost. Compute the unit cost for the current year using the total cost and workload information. (See Section 2.5.)
- Compute outyear cost estimates using unit cost information and the estimated outyear workload information. (See Section 2.6.)
- Do not include in the initial baseline any costs associated with previously approved process changes or AIS. Such costs are included as part of one or more alternatives.

This baseline will be used as input to the FEA model which will apply appropriate inflation indices and compute savings from alternatives.

[5] The definition of baseline is evolving and will be further refined as corporate IM and FEA tools and methodology mature.

This process ensures that the full functional environment is considered. Prior investments approved without the benefit of functional process improvement are not automatically assumed to be part of the baseline. Previously approved investments will need to be included in an approved alternative to proceed. For example, an AIS approved prior to selection of a migration system may be terminated if it does not support the approved plan.

The FEA scenario (Appendix B) illustrates the development of the baseline by establishing the unit cost based on FY94 total cost and workload provided by the functional manager. Outyear estimates are computed by multiplying the workload estimate by the unit cost.

Using an Approved Baseline

In the future, new, expanded functional process improvement efforts may be initiated by functional managers. At that time, the current baseline will be based on the approved plan and the status of the functional process, funding levels, project performance, etc. This is discussed in more detail in Module 6.

Approved Baseline

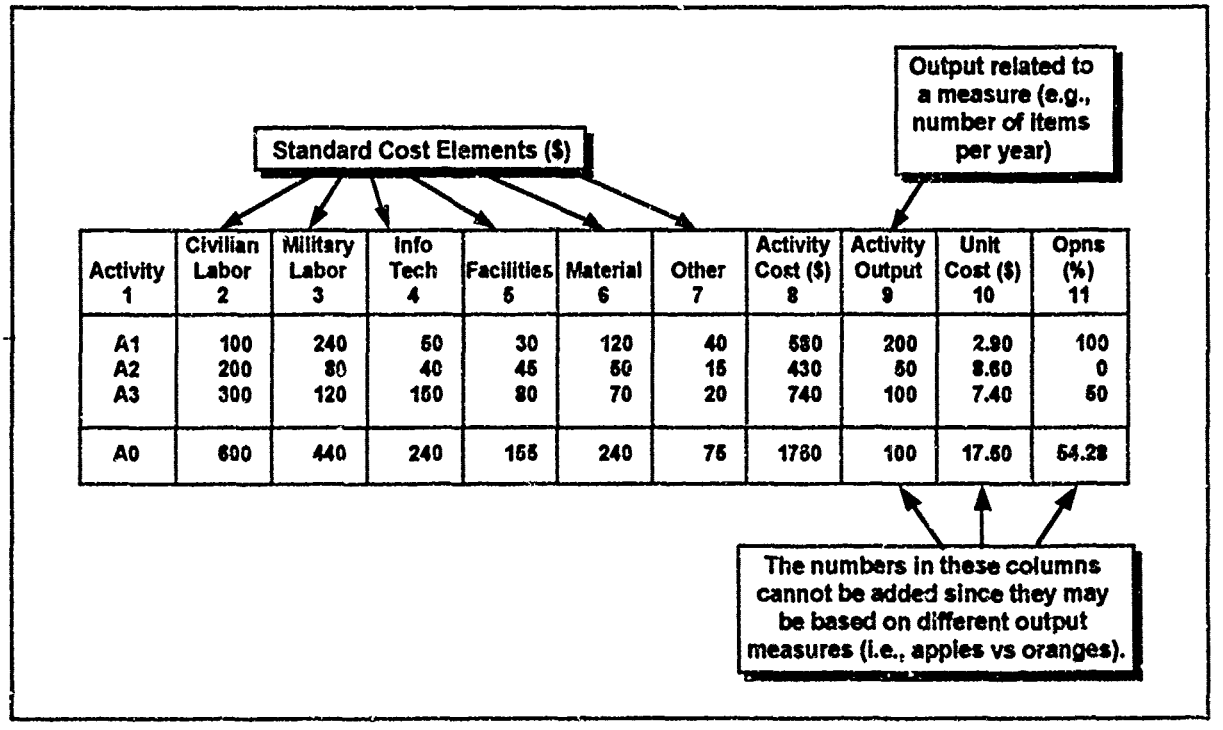
An *approved baseline* describes the resources needed, using current processes and reflecting pending changes, to satisfy current and future workloads.

A baseline provides a standard for comparisons. Performance measures provide the common factors (e.g., cost per output measure) for these comparisons. One type of cost comparison involves the predicted cost of alternatives, which we will discuss in Module 4. Another comparison involves monitoring actual activity costs to planned activity costs, which we will discuss in Module 6.

2.5 Cost Analysis of Functional Activities

The previous section stated that the AS-IS model for the baseline must include the current cost of doing business. This section describes the activity cost analysis procedure for figuring out the current cost of doing business. This discussion focuses on the output of the activity cost analysis effort, not on the procedures of cost analysis. Specifically, we will present the activity cost worksheet for the functional activity.

Activity costing has several uses throughout the process improvement effort. Activity costing can guide the activity modeling effort. We have already mentioned that it measures the actual cost of your function (i.e., to develop the current cost of the baseline). We will discuss in Section 2.6 how the cost worksheet presented here will help to project future costs for the baseline.



Activity 1	Civilian Labor 2	Military Labor 3	Info Tech 4	Facilities 5	Material 6	Other 7	Activity Cost ($) 8	Activity Output 9	Unit Cost ($) 10	Opns (%) 11
A1	100	240	60	30	120	40	590	200	2.90	100
A2	200	80	40	45	60	15	430	50	8.60	0
A3	300	120	150	80	70	20	740	100	7.40	50
A0	600	440	240	155	240	75	1760	100	17.60	54.28

Figure 2-2. The Activity Cost Worksheet

The activity cost worksheet in Figure 2-2 represents the historical costs associated with a function. The (A0) row contains the totals for standard cost elements and frequently can be related to actual budget values. The key components of this worksheet are:

- *Activities*. The first column of the cost worksheet represents each activity defined by an activity model or a node tree for the function. Activities A1, A2, and A3 are "sub-activities" of activity A0.

- *Cost Elements*. Cost elements are factors of production.[6] They are the specific resource inputs to activities. To facilitate preparation of the FEA, we chose the cost elements used in Version 2.3 of the FEA Model (see Module 4): Civilian Labor, Military Labor, Information Technology, Facilities, Material, and Other.[7] Columns 2 - 7 show the current level of resources used by an activity for each cost element.

- *Activity Cost*. Activity cost represents the total cost associated with an activity. Resources for each cost element are simply added for a total activity cost (column 8).

- *Activity Output*. An activity output shows the annual volume of the primary output[8] for that activity. Types of primary output may include: number of patients treated, tons of waste removed, number of soldiers trained. Activity output is simply the annual quantity (volume) of output units produced: *4,000* patients treated, *16,000* tons of waste removed, *1,367* soldiers trained.

- *Unit Cost*. Unit cost (column 10) shows the relationship of inputs to outputs. It is the average cost of producing a unit of output. Unit cost is calculated by dividing the activity cost (column 8) by the activity output (column 9). Unit cost is an important indicator of how efficiently an activity transforms inputs (resources) into outputs.

- *Operations %*. The final column represents the percentage of total activity cost directly related to the primary output of that activity. Costs directly related to primary outputs are called "operations" costs.[9]

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[6] C. Berliner, and J.A. Brimson, *Cost Management for Today's Advanced Manufacturing*. Boston: Harvard Business School Press, 1988.

[7] Definitions of these cost elements are provided in Appendix A.

[8] See Appendix D for an explanation of primary output.

[9] Costs indirectly related to primary outputs are called Management & Support costs. These costs cannot be easily or economically related to primary outputs, typically support more than one output, and are defined by their secondary outputs. The Operations % is used later to calculate the "tooth-to-tail" ratio in the FEA Model. (See Module 4 for more information on operations costs, tooth-to-tail ratio, and the FEA Model.)

2.6 Projecting the Baseline Activity Costs

The FEA will compare the projected future costs of each alternative to the current baseline over a given planning horizon (i.e., analysis period).[10] Remember that the baseline is not just a single point in time, but rather, a series of points (i.e., a line) over a time horizon. The activity cost worksheet presented in Section 2.5 shows only one year of cost data. Thus, future costs must be projected for the baseline. The activity cost worksheet is the basis for projecting future costs for the baseline. In this section, and in Section 3.3, we present a process for developing the future costs of the baseline and alternatives.

The cost worksheet shows *historical* costs associated with the *current* method of doing business. The FEA shows *future* costs for the baseline and alternatives. Inflation (and deflation), future workloads, process changes, and investments influence future costs. (Inflation will be discussed in Module 4.) Therefore, if workloads and budgets stay the same, and no process changes or investments are made, projected costs are approximately the same as current costs (excluding the effects of inflation). However, how are projections made if one or more of these factors does change? We deal with the first two issues (budgets and workloads) separately in this section and the other two issues (process change and investment) collectively in Section 3.3.

Changes in Future Budgets

First, although future costs are affected by the budget outyears, budgets are important in FEA for comparison purposes only. Therefore, don't use proposed budgets to help *project* the cost of a baseline or alternative; use them simply to measure the affordability of a baseline or alternative.

Projecting Costs Based on Changes in Future Workload

Second, changes in workload will likely produce changes in cost. The total cost of producing 400 widgets this year should be less than the total cost of producing 500 widgets last year. But how much less? The cost worksheet contains workload information in the *activity output* column. If the workload decreases (or increases), the activity output for each alternative can be adjusted downward (or upward) similarly. Remember, activity cost equals unit cost times activity output. Therefore, as Figure 2-3 shows, cost will decrease *at the same rate workload decreases.*

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[10] The FEA Model, presented in Module 4, recommends a period of analysis from 12-18 years: six years of data entry and 6-12 years of residual.

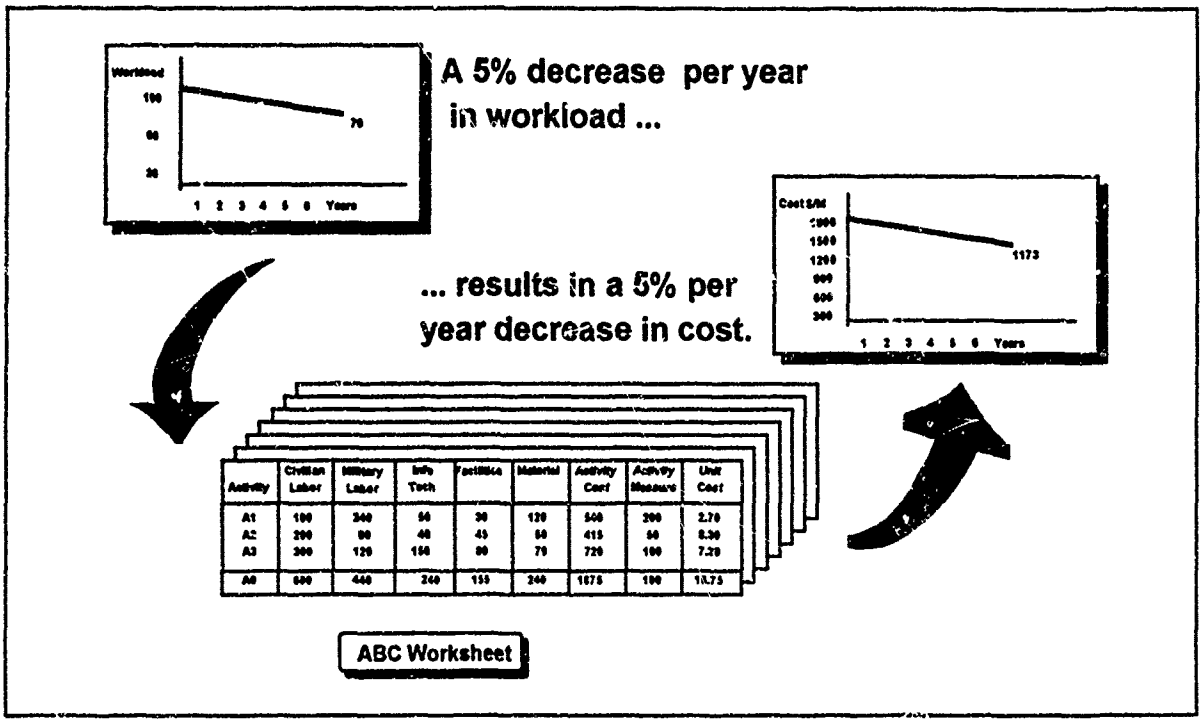


Figure 2-3. Projecting Baseline Costs Using the Activity Cost Worksheet

This adjustment based on workload changes, while quite simple, only serves as an initial estimate of future cost. The analyst may need to make some additional adjustments to the cost worksheet before using it to project future costs. Sometimes, the level of certain *recurring* and *one-time costs* does not change when the workload (level of output) changes.

Fixed Costs. Recurring costs are normally variable costs. That is, recurring costs usually vary with workload or other factors. Some recurring costs such as facility maintenance, or personnel travel may not change with small changes in the scale of operations (i.e., they are *fixed costs* in the short term). For example, if workload decreases by 5%, facility maintenance may stay the same. (At some point though, say a 20% decrease in workload, we would expect to see a reduction in expenditures for facility maintenance.) Thus, if some recurring costs are fixed, increases and decreases in workload may not yield a proportional increase/decrease in cost.

Depreciated One-time Costs. The cost worksheet may also contain capital asset costs, such as buildings. One-time costs may be amortized in the cost worksheet. This amortization is used to show the percentage of the asset used by the activity over a one-year period. Amortized one-time cost information is not applicable to the FEA. The FEA only

shows costs *when they are incurred (i.e., "cash flow")*. Therefore, remove one-time costs that *have been depreciated* in the cost worksheets *before* projecting the cost worksheet.[11]

Sunk Costs. The FEA reflects resource impacts when they occur. The FEA is a decision making document, and therefore, costs incurred before a decision are not included in the analysis. Sunk costs, because they were incurred *before the decision* are irrelevant to the decision and are not included in the FEA.

Summary. Figure 2-4 summarizes the process for projecting the future cost of the baseline by using the activity cost worksheet:

USING THE ACTIVITY COST WORKSHEET TO PROJECT COSTS

1. Remove "fixed" recurring costs. (i.e., those that will not change with changes in the workload).
2. Make sure the cost worksheet does not include any depreciated one-time costs or sunk costs.
3. Recalculate unit cost with the costs that remain in the worksheet (activity cost/activity output).
4. Project future costs by multiplying the new unit cost by the future workload (activity output).
5. Add the fixed, recurring costs from step 1 back into the projected values.

Figure 2-4. Projecting Costs

[11] Consider a facility with a 50-year useful life and construction cost of $10 million. The cost worksheet may reflect this as a capital cost and show the amount of the facility *used* by an activity during a one-year period. ($10 million / 50 years = *$0.2 million/year*). The FEA, however, reflects the facility resource impact when it occurs and would not show a cost of $0.2 million/year.

FEA Example

4. **Baseline Models and Costs.** The functional manager directed the development of the baseline, which comprises an AS-IS model and associated costs, as the basis for process improvement.

AS-IS Activity Model. Figure B-6 shows a node tree for the supply functional activity.

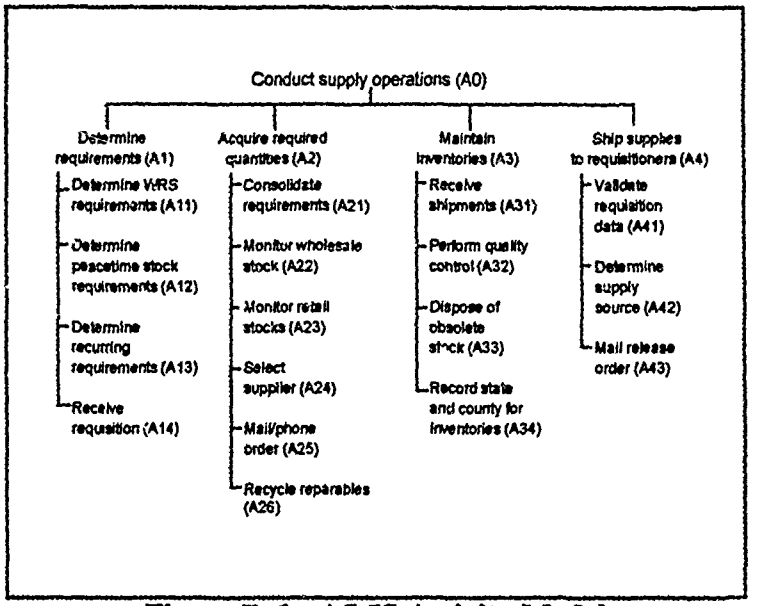


Figure B-6. AS-IS Activity Model

AS-IS Cost Worksheet. Figure B-7 presents the activity costs for supply operations. Actual costs were developed and then allocated to the activities. The most recent actual cost data available were from FY92. These numbers were obtained, then inflated to equivalent FY94 values. This conversion from FY92 to FY94 values produced the bottom-line totals in Figure B-7; these numbers were then allocated to the activities in the AS-IS node tree.

Activity	Personnel	Info Tech	Facilities	Material	Other	Total	Activity Output (K)	Unit Cost ($)	Opns %
Determine Req'mts	10.0	3.0	1.0	2.0	5.0	21.0	150	140	50%
Acquire Quantities	41.0	9.0	1.0	6.0	17.0	74.0	305	243	80%
Maintain Inventory	225.9	4.1	64.2	2,301.3	92.2	2,687.7	5150	522	90%
Ship Supplies	90.0	6.0	1.0	23.0	40.0	160.0	800	200	62%
	366.9	22.1	67.2	2,332.3	154.0	2,942.7	3,924	0.75	

Figure B-7. AS-IS Activity Cost Worksheet ($ millions)

Cost Baseline. Figure B-8 shows the cost baseline. For an initial FEA, the baseline is the cost of accomplishing the known and projected workload, using the existing functional process with no changes.

The cost baseline contains two sections. The top section of the figure shows the day-to-day recurring costs associated with conducting supply operations. The bottom portion shows investment costs. These investment costs represent planned expenditures of procurement dollars to acquire programmed replacements for existing automated systems.

If investments were planned for process improvements, they would be reflected in the bottom section of Figure B-8. However, as explained elsewhere in this publication, the baseline for the initial FEA in a functional activity does not reflect investments for previously planned process improvements.

COST ELEMENT	FY94	FY95	FY96	FY97	FY98	FY99
RECURRING COSTS						
Personnel	366.9	360.2	353.5	346.9	340.2	333.5
Info Tech	7.0	6.5	9.9	13.4	16.8	20.3
Facilities	67.2	66.1	65.0	64.0	62.9	61.8
Material	2,332.3	2,295.0	2,257.7	2,220.3	2,183.0	2,145.7
Other	154.2	145.8	137.4	140.4	142.0	142.0
Total	2,927.6	2,873.6	2,823.5	2,784.0	2,744.9	2,703.3
INVESTMENT COSTS						
Personnel	--	--	--	--	--	--
Info Tech	15.1	18.0	21.0	12.5	5.5	--
Total	15.1	18.0	21.0	12.5	5.5	--
TOTAL COST	2,942.7	2,891.6	2,844.5	2,797.5	2,750.4	2,703.3

Figure B-8. Cost Baseline ($ millions)

2.7 Questions and Answers

What is the standard representation for AS-IS and TO-BE activity models?

Models prepared in IDEF0 are considered standard.

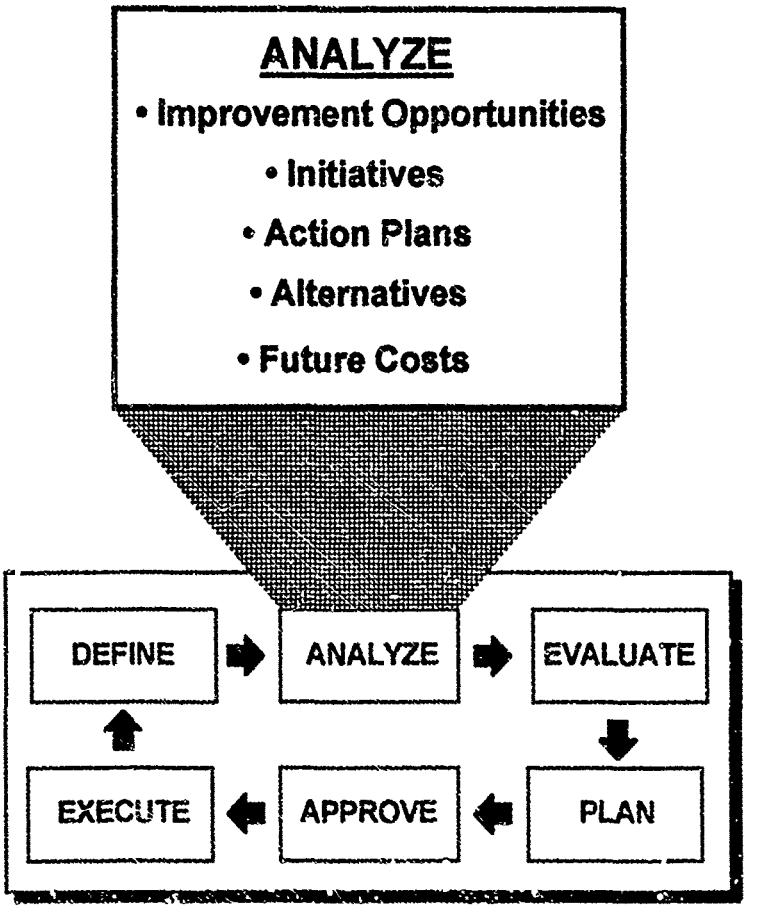
Where and when does activity costing enter into FEA?

Activity costing is normally performed after the activity modeling effort and before the development of improvement opportunities, initiatives, and alternatives (as discussed in Module 3). The activity costing effort helps to analyze the existing activities, supports the development of alternatives prior to the FEA (i.e., it helps in developing costs for the alternatives), and supports future reporting of actual activity performance.

Functional
Economic Analysis
Guidebook

MODULE 3:

Develop Alternatives


ANALYZE
• Improvement Opportunities
• Initiatives
• Action Plans
• Alternatives
• Future Costs
DEFINE
ANALYZE
EVALUATE
EXECUTE
APPROVE
PLAN

3.1 Module Objectives

This module will describe the information needed to begin FEA, emphasizing the purpose and development of alternatives to the baseline. At the completion of this module, you will be able to explain how to:

- Select and formulate the most promising improvement opportunities into meaningful initiatives.
- Combine initiatives into meaningful alternatives.
- Identify and estimate costs and cost savings associated with each alternative.

Key Terms in This Module

Action plan
Alternative
Improvement opportunity
Initiative
Investment

3.2 What is an Alternative?

Alternatives are formed during the analysis phase. FEA procedures call for at least two alternatives to the baseline and emphasize functional improvement before technical improvement, i.e., do it better before you do it faster.

Alternatives are developed to provide functional management with insight to the financial and operational impact of proposed improvement changes. This development is a complex process. The methodology illustrated in Figure 3-1 is used iteratively to arrive at the recommendations presented in each alternative.

Alternative

An *alternative* is a slate of initiatives that can achieve a functional activity's intended TO-BE state.

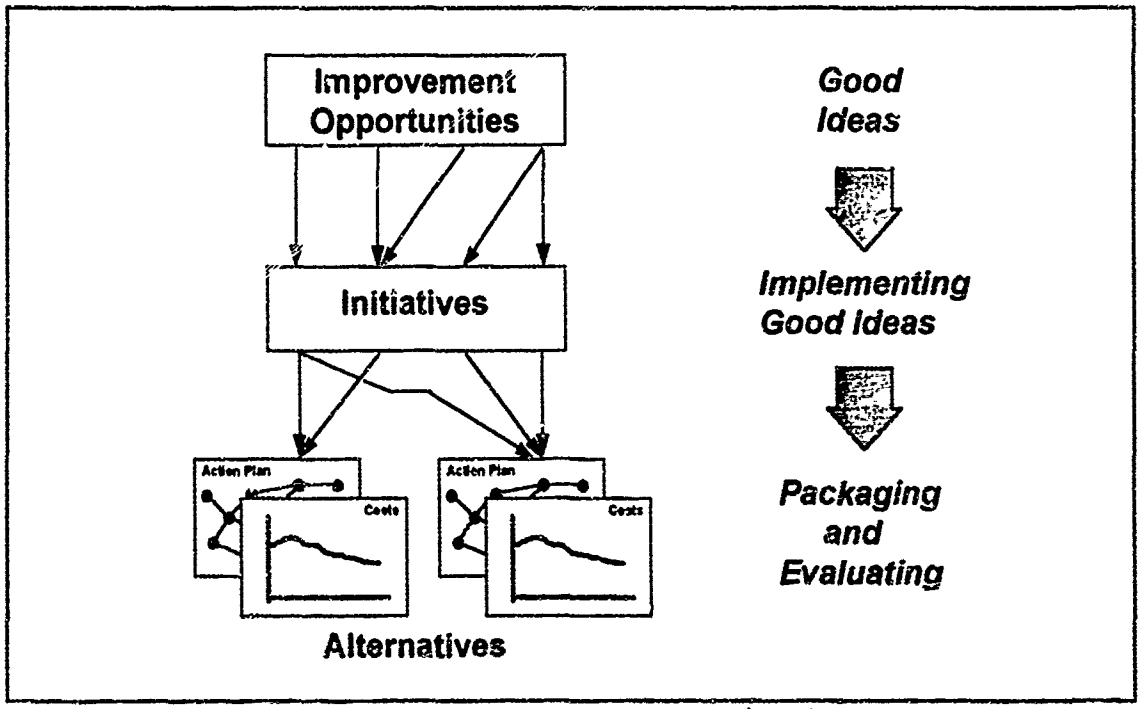


Figure 3-1. Packaging Improvement Opportunities into Alternatives

- **Improvement opportunities.** These are *what* needs to be done to the current AS-IS environment to move toward one or more of the future, or TO-BE, functional objectives. Functional experts discover improvement opportunities through observation, intuition, analysis of AS-IS activity and data models and functional direction, and personal experience. Improvement opportunities can be

changes to prevent or correct problems or deficiencies, to emulate best practices, or to implement innovation.

- **Initiatives.** These are *how* improvements can be accomplished, typically in terms of projects and related action plans. An initiative has a result or product that requires time and resources. Each initiative must be accompanied by a cost profile that reflects its resource use. A result can be a change in the business process with a resulting change in activity costs and performance values.

- **Alternatives.** Each alternative is presented as a table of future costs (totaled by fiscal year) that identifies functional activity and investment costs by cost element (e.g., civilian labor cost, material cost), consolidated action plan, and estimated performance values. Investment costs are derived from initiative cost profiles. A separate activity cost worksheet is prepared for each fiscal year for each alternative, recording the planned changes in an activity cost and performance as initiatives are completed.

Improvement opportunities are generated by project teams of functional experts and customers supported by analysts who, as a team or individually, analyze IDEF process and data models. Process models allow the team to visualize the process activities and to brainstorm improvement ideas. Also, by analyzing the cost and output of the process activities, emphasis can be directed to activities with high unit cost and/or unacceptable performance. Data analysis identifies the knowledge source of the data and processes that redundantly and inaccurately create and handle the same data.

The next step is to rank potential benefits and the investments required to achieve each opportunity and the degree of support for functional goals. This information provides the basis for initial evaluation and prioritization. These improvement opportunities are extended and refined during analysis.

An economic analysis or action plan for each improvement opportunity is too burdensome. The team, instead, uses an iterative process to reduce the number of factors. The team eliminates opportunities with little benefit or relationship to functional objectives. They develop initiatives to implement the selected opportunities. Ultimately, the team groups initiatives into separate, reasonable approaches (i.e., alternatives). This process of concentrating improvements is repeated until the team identifies coherent plans and management options.

While the process of combining these disparate ideas and actions is not straightforward, neither is it undirected. Models, often matrices, are used to evaluate, prioritize, and establish relationships among the many improvement opportunities. An alternative may need adjustments, and this may require reconvening the core team of functional experts and the financial analyst after the alternative's initial submission.

Forming Alternatives

To perform economic analysis, alternatives must have the same high-level planning horizon, primary outputs, and workload as the baseline. Alternatives change one or more of the basic elements illustrated in Figure 3-2 as follows:

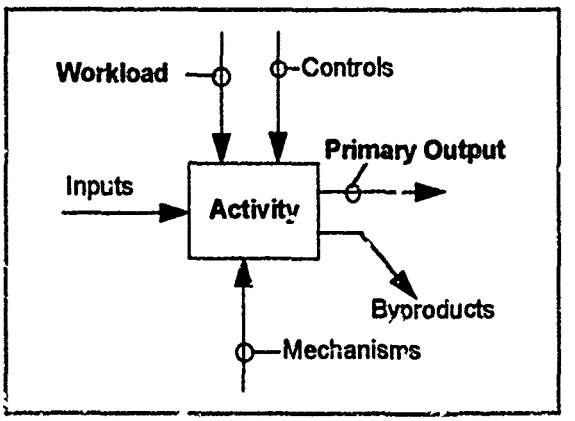


Figure 3-2. Activity Elements

- **A different input.** A process improvement may reduce costs by simplifying an input (changing the input's properties while retaining its fit, form, and function).
- **A different control.** A revised regulation may relax a process tolerance, causing a cost decrease.
- **A different byproduct.** An improved process may reduce or eliminate waste.
- **A different mechanism.** Changing the skill level may reduce the time and cost to execute a task, or automating a process may reduce cost by displacing manual activities (offset by the process automation investment).
- **A different set of activities.** Eliminating non-value added activities.

While each of these changes can be made independent of the others, at least one of these factors must be different in the alternative from its condition in the baseline.

Non-Value Added Activities in Alternatives

Non-value added activities are activities that create delay, excess, or variation in a process. Analysis of the baseline activities exposes non-value added activities. Activity titles with the following words usually reveal non-value added activities: move, wait, check, review, verify, store, inspect, rework, record, and approve. Any activity that the customer does not value should be eliminated or significantly reduced.

Actions to eliminate or significantly reduce non-value added activities are included in the action plan for an alternative, where they can be reviewed and approved by the functional manager. Savings are part of activity cost reductions of the alternatives.

FEA Example

5. **Results of Process Improvement Analysis.** The functional manager convened a group of functional experts, customers, and analysts and developed improvement opportunities, initiatives, alternatives, and associated action plans.

Improvement Opportunities. Figure B-10 summarizes the improvement opportunities for the functional activity. It is projected that it will take five years to fully implement a new functional process. Because our process improvement begins in FY94, the steady-state year is FY99. Of course, even before full implementation is achieved, incremental improvement will be achieved as various elements of the redesigned process are put in place. The quantification of projected benefits in Figure B-10 was used to focus attention on high-payoff improvement opportunities. In most cases, improvement opportunities will nave to be implemented in combination with each other in order to achieve the projected steady-state benefits.

	Improvement Opportunities	Projected Steady-State Benefits
1	Implement just-in-time inventory procedures.	3-5% reduction in unit cost. 10-day reduction in order-ship time.
2	Integrate wholesale and retail logistics operations.	20-day reduction in order-ship time.
3	Minimize low dollar-value contracts.	5% reduction in cost of procurement and contract payment operations.
4	Eliminate requirement to report inventories by state and location (non-value added).	5% reduction in unit cost.
5	Eliminate requirement to validate requisition data (non-value added).	1-hour reduction in requisition processing time.
6	Implement electronic commerce (EC) and electronic data interchange (EDI).	2-3% reduction in unit cost.
7	Implement paperless transaction system.	1-3% reduction in unit cost.
8	Consolidate contract payment operations.	5% reduction in cost of contract payment operations.
9	Implement data sharing/migration.	2% reduction in unit costs.

Figure B-10. Improvement Opportunities

Note that two of the improvement opportunities, numbers 4 and 5, are eliminations of non-value added sub-activities in the AS-IS node tree—subactivities A34 and A41. Elimination of these non-value added activities will be made a part of each alternative that is developed.

Initiatives. Figure B-11 contains the initiatives that implement the improvement opportunities listed in Figure B-10.

Initiatives	Time	Constraints
Install new system at large facilities.	1 month per site	Must include training time.
Install new system at small facilities.	2 weeks per site	Must include training time.
Prepare letter requesting policy change on inventory reporting.	1 month	
Develop training programs.	6 months	Training to be conducted on-site by in-house personnel.
Build data system.	10 months	Must provide export capability.
Select migration inventory system.	2 months	Must provide export capability. Must be compatible with current LAN.
Develop interface between inventory system and contract payment system.	5 months	
Merge inventory databases.	4 months	
Develop new policy and procedure documents.	2 months	Joint in-house/contractor team. Must be ready before implementation at first site.
Implement training programs.	1 month per site	Cost negligible if done in-house.
Disseminate information on revised procedures to all users.	Ongoing	Plan an aggressive information program.

Figure B-11. Initiatives

Alternatives. After reviewing the improvement opportunities to determine the extent to which they contribute to the achievement of the objectives established in the functional direction, the alternatives in Figure B-12 were developed for more detailed analysis.

Alternative	Title & Description
A	**Centralized Procurement with EC/EDI** Fully implement EC and EDI. Implement at large supply facilities first. Integrate retail and wholesale supply and standardize AIS throughout the system. Maximize buying power by consolidating contracting operations. Eliminate recording state/county data for inventories.
B	**Local Procurement with EC/EDI** Implement EC and EDI at retail level. Capitalize on supply centers' relationships with local suppliers. Eliminate recording state/county data for inventories.

Figure B-12. Alternatives

TO-BE Models. A steady-state TO-BE activity model is provided for each alternative. These are shown in Figures B-13 and B-14.

Each of these alternative node trees calls for the elimination of the non-value added activities identified earlier. Additionally, each of the TO-BE models indicates that

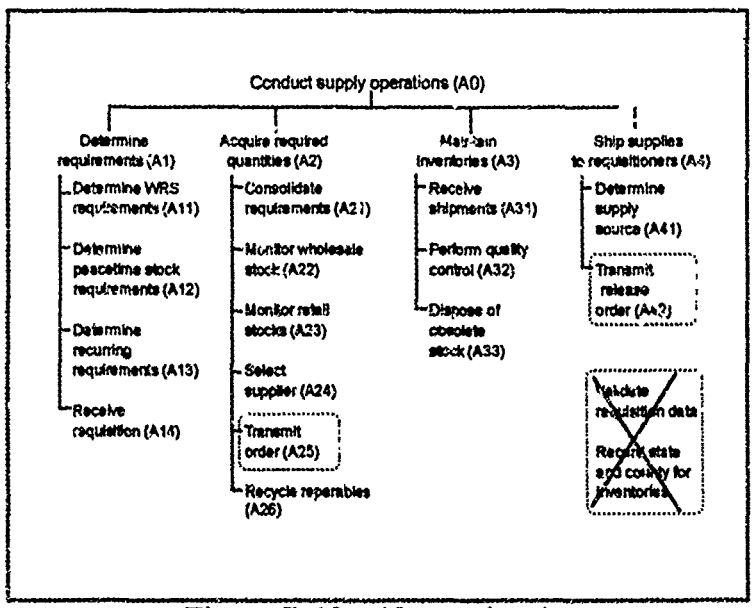


Figure B-13. Alternative A TO-BE Activity Model

activities being done today by mail or by telephone will in the future be done by electronic transmission. These remaining but modified sub-activities are highlighted in dashed boxes.

The difference between the two alternatives in steady state is that Alternative B, with its increased reliance on local procurement operations, eliminates activity A21, the consolidation of requirements.

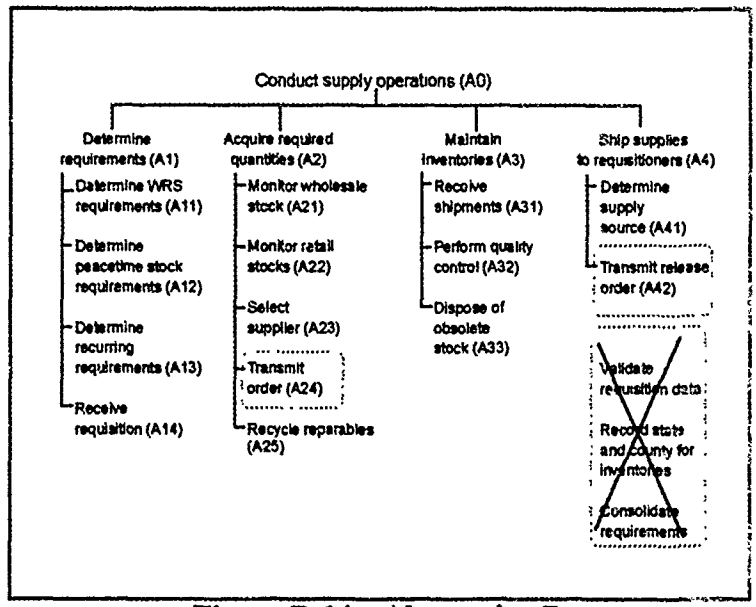


Figure B-14. Alternative B TO-BE Activity Model

Relationships. The specific relationships among improvement opportunities, initiatives, and alternatives are shown in Figure B-18.

Alternative	Initiative	Improvement Opportunity
Alternative A. Centralized procurement with EC/EDI	Select migration inventory system. Install system at supply centers. Develop training programs. Develop policy and procedure documents. Implement training programs.	Implement just-in-time inventory procedures.
	Merge inventory data bases. Develop training programs. Develop policy and procedure documents. Implement training programs.	Integrate whole and retail logistics operations.
	Merge inventory data bases. Develop policy and procedure documents.	Minimize low dollar-value contracts.
	Prepare letter.	Eliminate requirement to report inventories by state and location.
	Develop policy and procedure documents.	Eliminate requirement to validate requisition data.
	Develop interface between inventory system and contract payment system.	Consolidate contract payment operations.
	Build data system. Merge inventory data bases.	Implement data sharing/migration.
Alternative B. Local procurement with EC/EDI	Select migration inventory system. Install system at supply centers. Develop training programs. Develop policy and procedure documents. Implement training programs.	Implement just-in-time inventory procedures.
	Prepare letter.	Eliminate requirement to report inventories by state and location.
	Develop policy and procedure documents.	Eliminate requirement to validate requisition data.
	Build data system. Merge inventory data bases.	Implement data sharing/migration.

Figure B-18. Relationships among Alternatives, Initiatives, and Improvement Opportunities

Action Plans. An action plan is provided for each alternative, and these are shown in Figures B-19 and B-20. Each action plan shows the time-phased initiatives that will be required in order to implement the alternative and achieve the improved functional process.

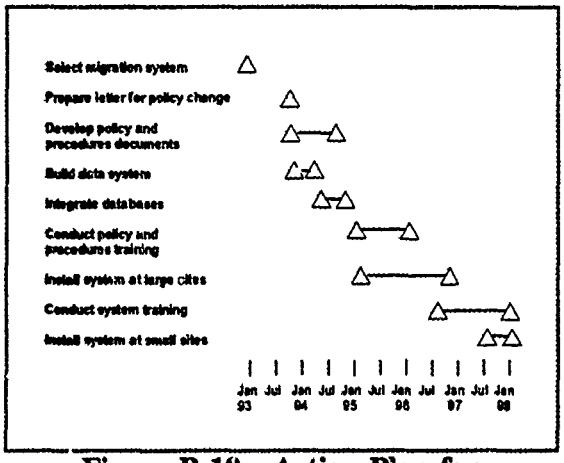


Figure B-19. Action Plan for Alternative A

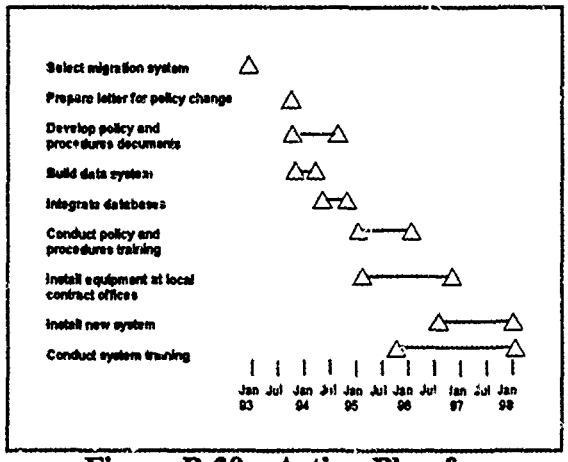


Figure B-20. Action Plan for Alternative B

Benefits. An estimate was made of the extent to which each of the alternatives will impact the measures established in the functional direction. This projection is shown in Figure B-22. Note that each alternative is assessed using both of the measures prescribed in Figure B-4 and the unit cost measure in Figure B-3. The projection shows how the baseline and each of the alternatives will perform at steady state.

Measure	Baseline	Alternative A	Alternative B
Unit Cost (per dollar of sales)	0.75	0.68	0.74
Order-ship Time	25 days	10 days	12 days
Direct Fill Percentage	50%	75%	60%

Figure B-21. Steady-State Comparison of Alternatives

3.3 Developing Costs for the Alternatives

Section 2.6 showed how to develop your time profile of baseline costs using projected workloads. This section describes, in general terms, how to develop similar profiles of function costs for the alternatives.

Step 1: Cost Changes for Initiatives

It is often easiest to start by estimating the cost changes (relative to the baseline) that will be generated by each initiative or project that is included in an alternative. Typically, these changes will include both increases in investment costs as well as decreases in recurring costs, the savings generated by the project.[1]

A variety of methods can be used to estimate the cost changes associated with an initiative; the appropriate choice depends on the nature of the initiative. Possible approaches include:

- **Best Practices.** If the initiative is based on a best business practice, what were the savings documented by other businesses? What were the implementation costs?

- **Analogy (Historical).** This method is similar to best practices, but applies to cases where there is no widely accepted standard. What is the maintenance cost for a laboratory facility in Anchorage, Alaska? Historical maintenance costs for laboratories, facilities in Anchorage, or (one hopes) laboratories in Anchorage can be used to estimate the current cost for maintenance of such a facility. Historical cost estimates are probably the most common source of cost estimates. Cost data bases exist for everything from office supplies to software maintenance.

- **Expert Opinion.** This is useful when cost sources or data bases are not available. This applies to new types of equipment, buildings, software, technology, etc. Consult the experts in the area for their estimate of investment costs and future savings.

- **Prototypes.** Prototypes are most useful when there is major uncertainty about proposed process, procedure, or supporting information system changes. Under these circumstances, other means of estimating may not be satisfactory, because there are not enough details and information on which to base an informed estimate.

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[1] Removing non-value added activities, however, may produce cost savings without an associated increase in investment costs.

- **Parametric Cost Estimating.** This offers a scientific, yet simplistic approach to developing costs. In parametric cost estimation, the initiative's components are broken down to a level for which cost data are readily available. The costs of the components are summed to arrive at a total cost. For example, if a house consists of 38,000 bricks and 5,000 shingles, the cost of the house can be estimated by finding out the cost of bricks and shingles.

If these cost changes are estimated by fiscal year, the cost profile for the alternative can be calculated as the sum of the baseline cost profile and the cost changes, as shown in Figure 3-3.

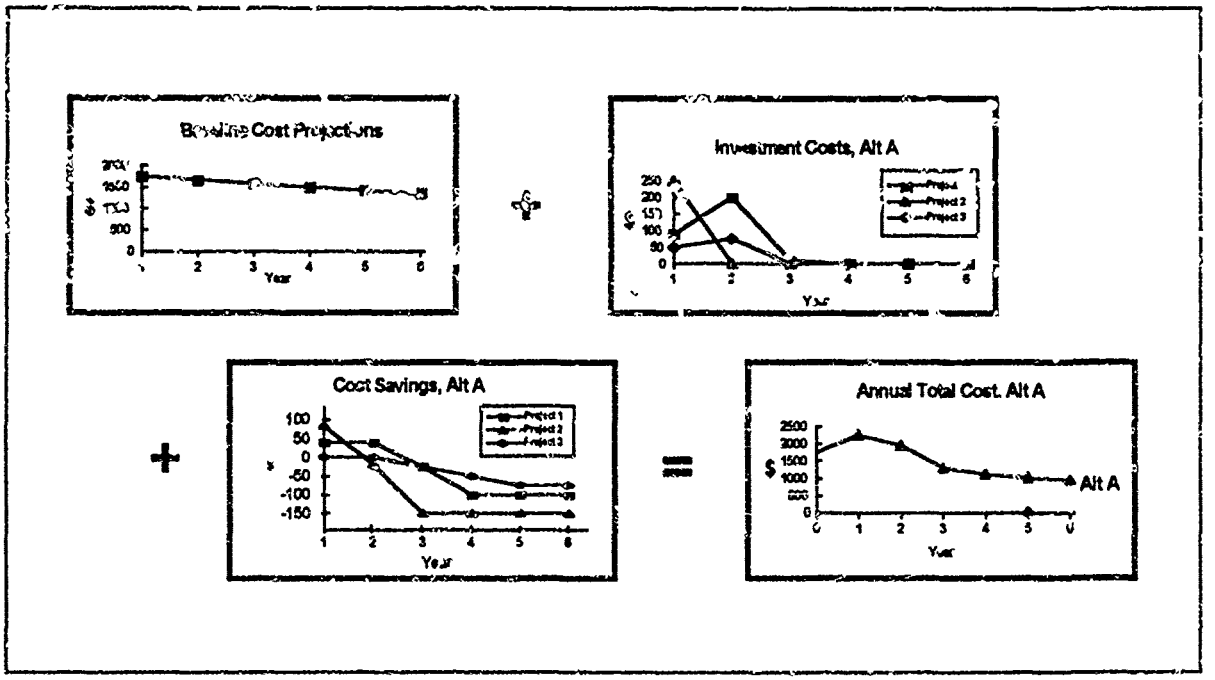

Figure 3-3. Calculating Alternative Function Costs

Step 2: Create Activity Cost Worksheets for the Alternatives

The functional manager needs to know how implementing alternatives affects the function. This is done by using the cost changes developed in Step 1 to modify the annual activity cost worksheets. While the activity cost worksheet is described at a very high level, costing should be worked in enough detail for the manager to appreciate where savings are to be achieved.

Step 2 is always completed for the selected alternative. When complete, you will normally have developed six worksheets to cover the six years to be entered in the FEA

Model in addition to the baseline. Other alternatives may be analyzed similarly at the discretion of the analyst.

The baseline activity cost worksheets, the savings computed in Step 1, and the changes to the AS-IS model are used to develop future year worksheets as illustrated in Figure 3-4. In Step 1, we determine "when" the functional changes can be made and estimate the size of the savings. The AS-IS model identifies which activities are affected. Savings are either allocated to activities or new activity costs are developed considering the process changes.

Determining how activity cost changes is complex. Changes in one part of the model can cause savings in many facets, often involving multiple activities simultaneously. After allocations are complete new unit costs are developed using estimated workload and the "activity based cost" graph prepared. These products show the functional manager how the alternative will affect the underlying functional processes as well as the overall cost profile.

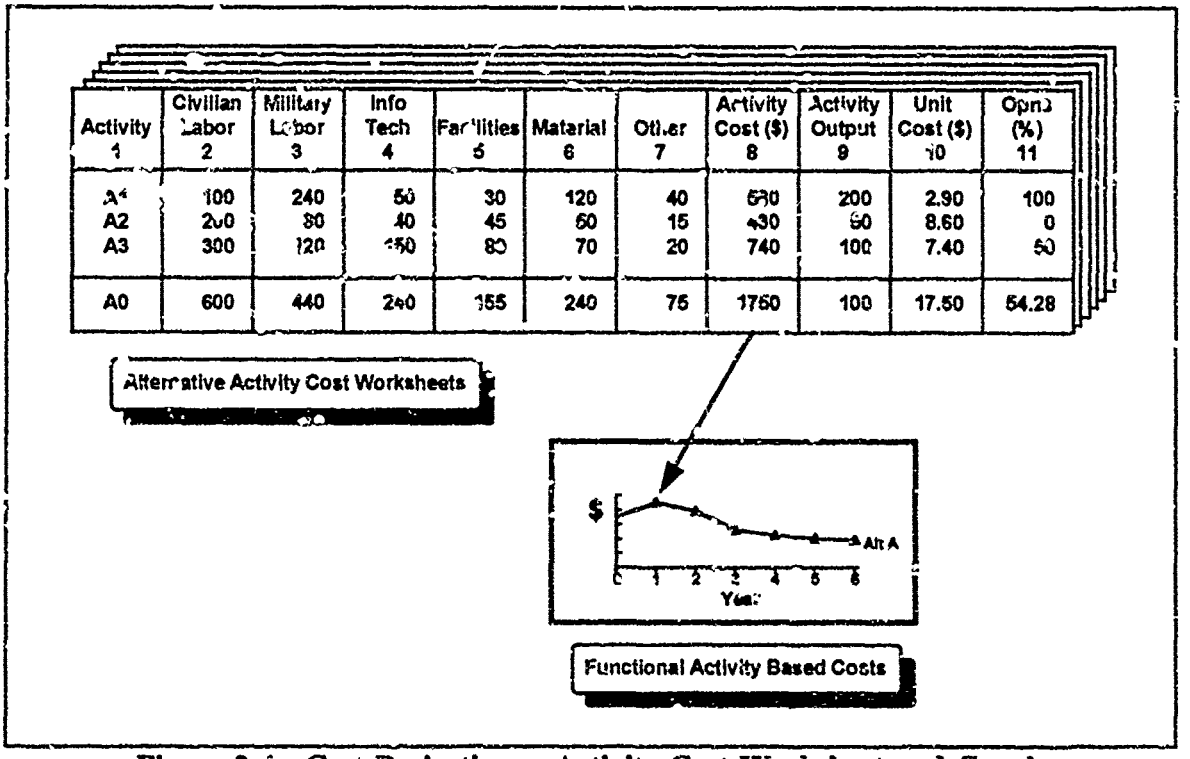

Figure 3-4. Cost Projections: Activity Cost Worksheet and Graph

The functional activity based costs can be compared with the functional costs from Step 1, baseline cost projections plus the cost savings. Because of the complexities, absolute computational accuracy may not be obtained. However, substantive differences should be explained on the worksheets and, if necessary, cost summaries adjusted.

There are four reasons for creating annual activity cost worksheets for each alternative. First, adjusting the baseline activity cost worksheets according to the cost change estimates for each project helps to verify those estimates. For instance, the cumulative cost savings in a particular activity from a series of projects cannot exceed the baseline costs projected in any fiscal year. Second, if you create activity cost worksheets for the alternatives, you have also determined the unit costs that can be expected for those alternatives. Third, as will be shown in Module 4, the activity cost worksheet is a good way to allocate costs to operations and management/support categories, as required in the FEA Model. If you have activity cost worksheets for the alternatives, you have a solid basis for this allocation. Finally, as a selected alternative will become the new baseline, preparing activity cost worksheets for the alternatives provides the cost information necessary to manage the changes embodied in the alternative

FEA Example

Cost Estimates. For entry into the FEA Model, cost estimates for the baseline and for each alternative were developed. For the baseline, these costs were previously provided in Figure B-8. For Alternatives A and B, the costs are shown in Figures B-22 and B-23, respectively. These tables show the cost of operating the functional process as it is changed over time, and the investment cost associated with the action plan. These data represent the "best estimate" of costs for the baseline and each alternative.

COST ELEMENT	FY94	FY95	FY96	FY97	FY98	FY99
RECURRING COSTS						
Personnel	366.9	355.0	343.0	331.1	319.1	307.2
Info Tech	22.1	21.4	20.7	19.9	19.2	18.5
Facilities	67.2	65.0	62.8	60.7	58.5	56.3
Material	2,332.3	2,256.4	2,180.4	2,104.5	2,028.5	1,952.6
Other	147.3	128.6	121.2	125.3	127.9	129.0
Total	2,935.8	2,826.3	2,728.1	2,641.5	2,553.5	2,463.6
INVESTMENT COSTS						
Personnel	3.2	2.6	1.9	1.3	.6	--
Info Tech	3.7	18.0	21.0	12.5	5.5	--
Total	6.9	20.6	22.9	13.8	6.1	--
TOTAL COST	2,942.7	2,846.9	2,751.1	2,655.2	2,559.4	2,463.6

Figure B-22. Alternative A Cost Estimates ($ millions)

COST ELEMENT	FY94	FY95	FY96	FY97	FY98	FY99
RECURRING COSTS						
Personnel	366.9	362.4	357.9	353.3	348.8	344.3
Info Tech	22.1	21.8	21.5	21.3	21.0	20.7
Facilities	67.2	66.4	65.6	64.7	63.9	63.1
Material	2,332.3	2,286.4	2,240.5	2,194.5	2,148.7	2,102.8
Other	147.3	127.2	118.5	121.2	122.5	122.2
Total	2,935.8	2,864.2	2,803.9	2,755.2	2,704.9	2,653.1
INVESTMENT COSTS						
Personnel	3.2	2.6	1.9	1.3	.6	--
Info Tech	3.7	18.0	21.0	12.5	5.5	--
Total	6.9	20.6	22.9	13.8	6.1	--
TOTAL COST	2,942.7	2,884.8	2,826.9	2,768.9	2,711.0	2,653.1

Figure B-23. Alternative B Cost Estimates ($ millions)

3.4 Questions and Answers

Who originates improvement opportunities?

Functional people and customers, supported by analysts, are the source of process improvements through their participation in interview sessions, process action teams, or structured workshops.

Is reducing my workload a cost savings?

Reducing workload by eliminating or reducing non-value added activities is a cost savings. Reducing value added activity workload (e.g., reduced mission requirements) is not considered a cost savings since costs *should* decrease with decreased workloads.

What's the difference between improvement opportunities and initiatives?

An improvement opportunity describes an actionable, potential change (to a process, mechanism, input, or control). An initiative, like a project, is a one-time deliverable that carries out a change.

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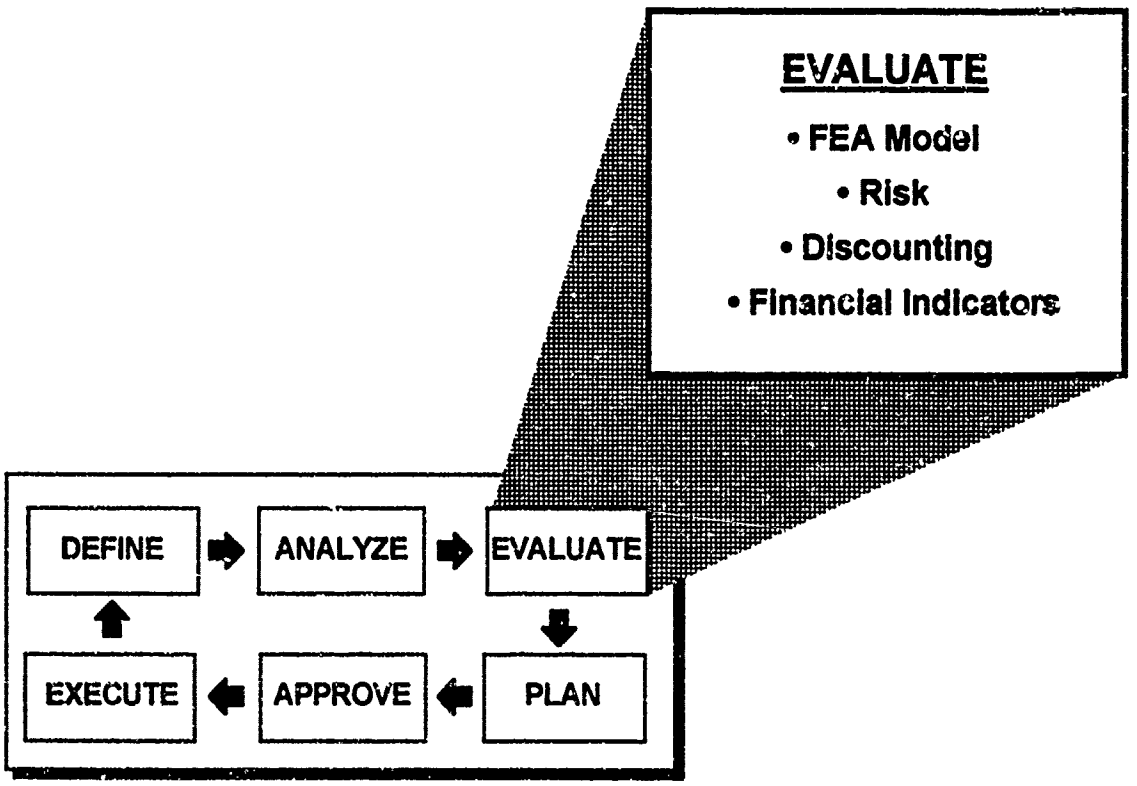
MODULE 4:

How to Compare Alternatives


EVALUATE
• FEA Model
• Risk
• Discounting
• Financial Indicators
DEFINE
ANALYZE
EVALUATE
EXECUTE
APPROVE
PLAN

4.1 Module Objectives

This module shows how to evaluate the alternatives generated from the preceding steps of the Functional Process Improvement program.

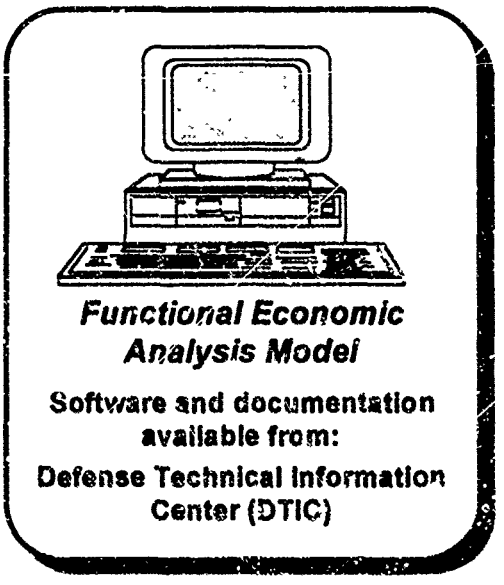
Comparing the total costs of the alternatives to the baseline is the principal task, and economic analysis provides the techniques used in making such comparisons. To facilitate the application of economic analysis techniques, DDI has developed the FEA Model, a microcomputer program that performs the necessary computations. Because there are a number of different financial indicators that can be used to summarize cost differences, the FEA Model also serves to standardize comparisons across FEAs developed for different functions. Having a common cost comparison methodology is important when proposed investments from different FEAs are being evaluated relative to one another.

Because of the central role played by the FEA Model, the discussion is organized around the major steps required to use the model. It focuses on the analysis steps required to use Version 2.3 of the FEA Model, not the details of operating the software. Consult the user's manual for the FEA Model for this information.

Section 4.2 demonstrates how to prepare the inputs to the FEA Model, principally the functional costs for the baseline and the alternatives described in Modules 2 and 3.

Sections 4.3 and 4.4 of this module describe the concepts of risk analysis and discounting. A basic understanding of these concepts is useful in interpreting the key financial indicator produced by the FEA Model—*risk-adjusted, discounted cash flow* (RADCF) savings.

Section 4.5 discusses how to use the financial information produced by the FEA Model in comparing alternatives.



At the completion of this module, you will:

- Know how to arrange baseline and alternative costs for use in the Functional Economic Analysis Model.
- Understand how discounting and risk analysis are used in the FEA Model to compare those costs.

Key Terms in This Module

Current and constant dollars
Discounting
Functional Economic Analysis Model
Inflation
Discount rate
Residual values
Risk
Risk-adjusted, discounted cash flow (RADCF)
Tooth-to-tail ratio

4.2 Function Costs and the FEA Model

Most of the information required to perform an FEA has been developed in the preceding steps of the FPI program. In particular, baseline activities have been modeled and their costs determined through activity costing, improvement opportunities and the initiatives required to implement them have been combined into alternatives, and the costs and benefits associated with the alternatives have been estimated. With this preparation, it is a straightforward matter to array costs for use in the economic analysis of alternatives.

Figure 4-1 shows the dimensions of the cost data required by the FEA Model. Costs must be arrayed by baseline and alternatives, cost element, fiscal year, management support versus operations, and life-cycle management (LCM) phase.

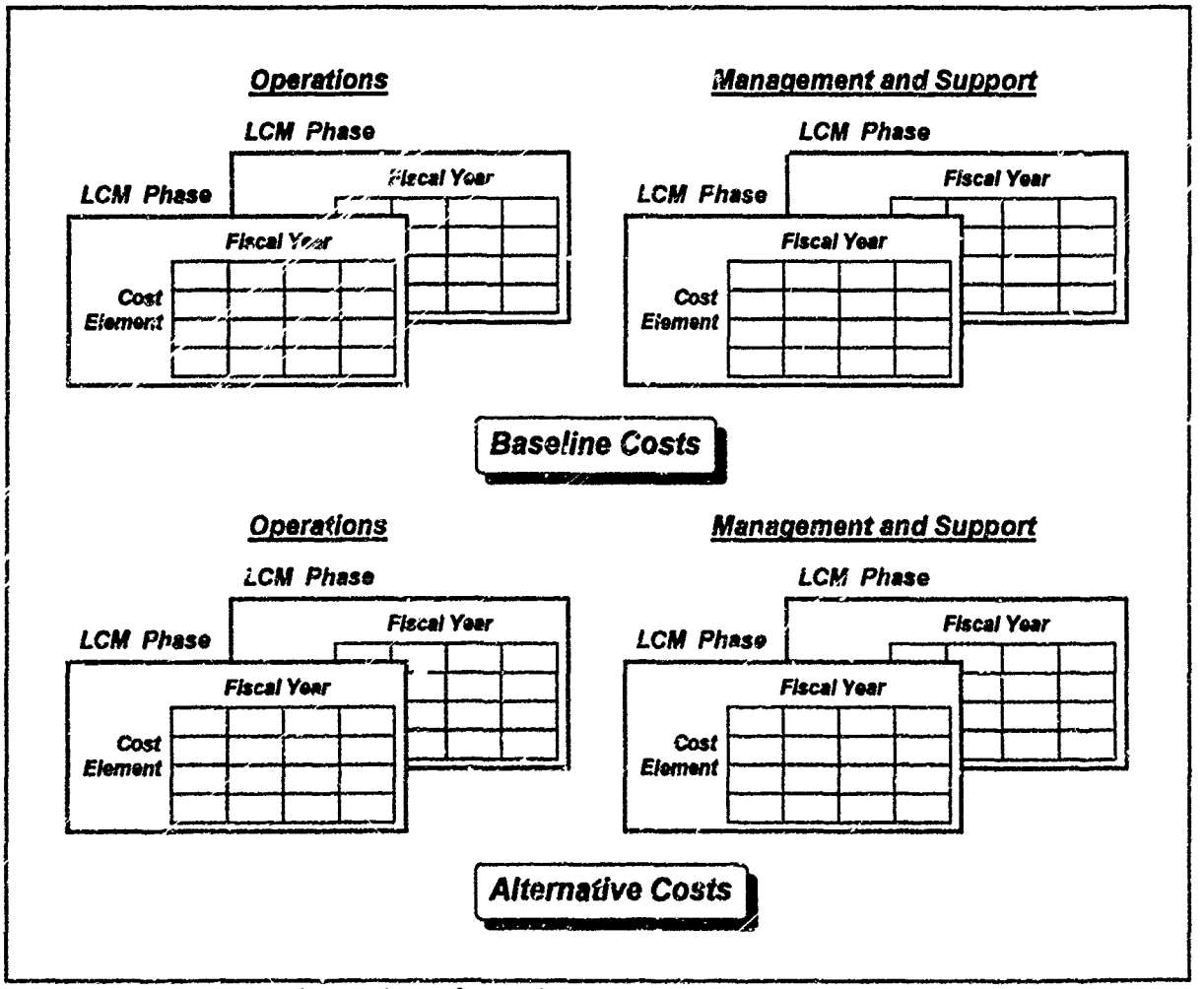


Figure 4-1. Cost Dimensions in the FEA Model

Baseline and Alternatives

Version 2.3 accepts data for five planning scenarios: the Defense Management Review Decisions (DMRD) Base, the Baseline, and three Alternatives. The DMRD Base represents function costs before any DMR cuts or force reductions; it is needed only for DoD-level FEAs. As described in Modules 2 and 3, the Baseline shows the expected costs of meeting projected workloads using the current processes for the function. The Alternatives display the costs of performing those projected workloads with improved processes.

Cost Element

As discussed in Section 2.5, cost elements organize costs by the factors of production, such as labor or machines. The principal cost elements used in the FEA Model are Civilian Labor, Military Labor, Information Technology, Facilities, Material, and Other.[1] The user's manual that accompanies the model describes what should be included in each cost element.

Fiscal Year

The analyst must enter costs for six fiscal years. In the financial calculations, the data entered for the sixth year is duplicated for an additional 2 to 20 years, at the analyst's discretion. These additional years of data, which are not displayed in the model's templates, are called *residual values*. It is best to use the number of residual values that, combined with the six years displayed individually, represents a reasonable life-cycle for the changes being evaluated. In most cases, the number of residual values used will affect the financial indicators calculated by the FEA Model, so it is a good idea to test the sensitivity of the results by altering the number of residual values assumed.

Management and Support Versus Operations Costs

Recall that the goal of the Defense Management Review is to reduce the costs of DoD functions while maintaining, to the extent possible, the operational capability of the Department. Alternatives that reduce the Management and Support (M&S) costs in their functions by proportionately more than the Operations (Ops) costs, in most cases, support

[1] In addition to these principal elements, Management and Support costs can also be shown as General and Administrative and Headquarters Support of Installations.

this goal. To indicate how well an alternative meets this objective, the FEA Model calculates the ratio of Ops to M&S costs (called the *tooth-to-tail ratio*) for each alternative.

The activity cost model provides the framework for dividing function costs into the M&S and Ops categories. Figure 4-2, which contains a sample worksheet for one fiscal year, shows how. First, decide what percentage of each activity is devoted to operations. Often, activities will fall exclusively into one category or another; but it's possible that an activity, such as A2, is a mix of the two. Unless the activities in the activity cost model change, the Ops percentages can be used for all fiscal years. With those percentages defined, determine the total operations costs for a cost element by multiplying the Ops percentages times the activity costs for that element (see Step 2). After Ops costs are calculated by cost element, Management and Support costs are the remainder of the total costs, as shown in Step 3.

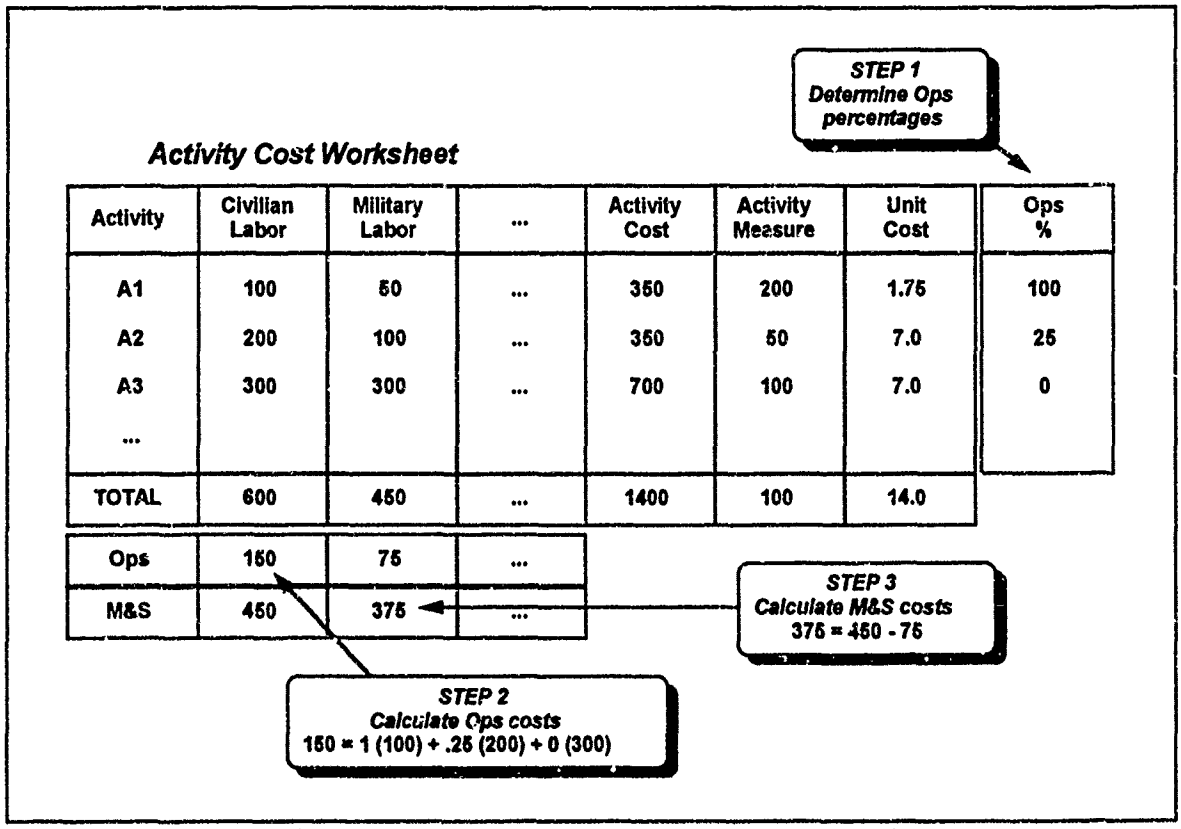


Figure 4-2. Allocating Costs to Ops and M&S

Life-Cycle Management Phases

Version 2.3 of the FEA Model divides both Ops and M&S costs into four phases of the acquisition life-cycle—Research, Development, Test, and Evaluation (RDT&E);

Investment; Operations; and Disposal. These phases are essential for analyzing and tracking expenditures for information technology projects; however, they are not generally required for understanding the costs of a function.

To simplify the entry of cost data into the FEA Model, a new cost structure has been developed. As shown in Figure 4-3, the new structure is a subset of the cells found in Version 2.3. To use the new structure, simply enter all the cost data into these cells, leaving the others blank. All the financial calculations and summary graphs comparing baseline and alternative costs will be unaffected by this procedure.[2]

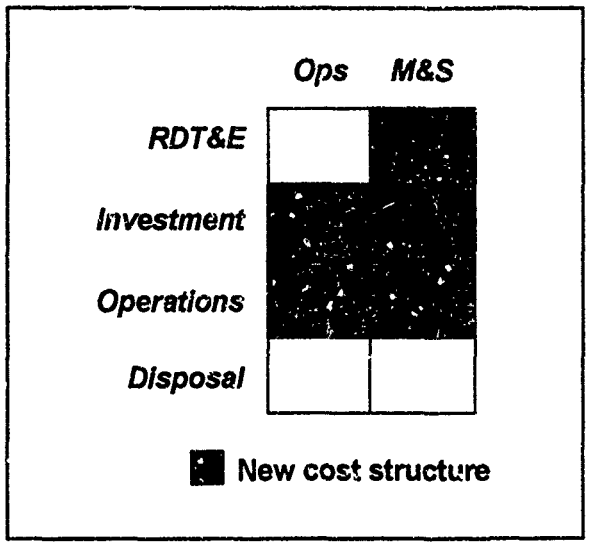


Figure 4-3. Cost Structure Comparison

Constant or Current Dollars?

Economic analyses express cost estimates in one of two forms: constant dollars or current dollars. The distinction between the two concepts is straightforward, but the terms are somewhat confusing. *Constant dollar* estimates represent the cost of the resources required to meet each year's workload using resource prices from one reference year. *Current dollar* estimates calculate the cost of the resources using the estimated prices for the year in which the resources will be purchased.[3] The difference between constant and current dollar estimates is the inflation in resource prices assumed to occur between the reference year and the purchase year.

Version 2.3 of the FEA Model accepts constant dollar, or noninflated, cost estimates. Note that the procedure suggested in Module 2 for projecting baseline costs—multiply projected workloads by the unit costs estimated in the activity cost analysis of historical expenditures—produces constant dollar estimates because it implicitly uses those historical prices to project future costs. Thus, these cost estimates can be entered directly, letting the FEA Model deal with the mechanics of inflating to current, or then-year, dollars.[4]

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[2] See Appendix F for the mapping between the new cost structure and the LCM cost structure.

[3] Current dollars are also called then-year or inflated dollars.

[4] Previous versions of the FEA Model assumed current dollar inputs. The inflation rates used in Version 2.3 of the model are those promulgated by the DoD Comptroller for budget preparation.

A Look Forward

With the inputs for the FEA Model defined, it is useful to jump ahead for a moment and examine the outputs of the model. The single most important display is the summary FEA chart, an example of which is reproduced in Figure 4-4. It has the following two components:

- The graph at the top plots annual function costs for six fiscal years for the baseline and alternative scenarios.
- At the bottom, a table shows three estimates of the risk-adjusted, discounted cash flow (RADCF) savings associated with each alternative.

The "savings" part of RADCF is easily explained: it is the cost of the baseline minus the cost of each alternative. Explaining risk adjustment and discounting takes a little longer; these topics are covered in the next two sections.[5]

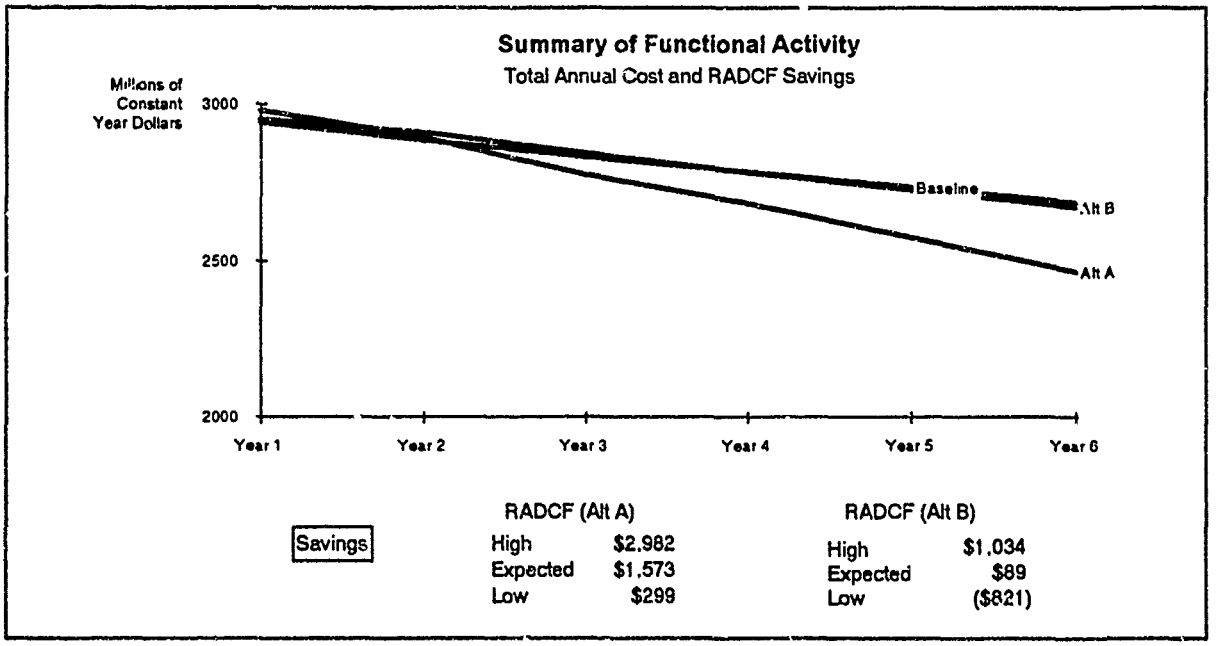

Figure 4-4. Summary Chart from FEA Model

[5] In adjusting for risk and discounting, FEA is consistent with the principles of economic analysis defined in Department of Defense Instruction 7041.3, *Economic Analysis and Program Evaluation for Resource Management.*

4.3 Risk Adjustment

Although the detail of the cost structures discussed in the last section suggests great precision, it is important to recognize that Functional Economic Analysis, because it looks to the future, has to be based on estimates. The accuracy of those estimates depends on the level of uncertainty, or risk, associated with the changes being proposed. For example, it is possible to estimate, with a good deal of confidence, how small changes in the scale of a function's operations will affect the function's costs. The unit costs developed in activity cost analysis provide the basis for making these estimates. On the other hand, estimates for a major change in business processes are more likely to be wrong because past experience provides less of a guide to future costs.

In choosing between different alternatives, it is important that the functional manager not only know the estimated cost for each alternative but also have some idea of the risks associated with each proposal.

To illustrate, consider choosing between an IT project, which is expected to produce large savings in material costs from an investment in cutting-edge information technology, and a training project, which is estimated to generate modest cost savings from an investment in staff training. Based on this information alone, the IT project looks more attractive. Now add the additional information that the risk associated with the new technology implies a 50% chance that the savings will be less than zero while the savings from the staff training look almost certain. The prudent manager would now be less likely to choose the information technology investment, at least as it is currently structured, because of the associated risk.

Risk Analysis in the FEA Model

Through its risk analysis procedures, the FEA Model provides a mechanism for recognizing risk in the comparison of baseline and alternative costs. For each cost cell in the cost structure, the model actually uses a *range* of cost estimates, rather than a single value, when it calculates the financial indicators comparing alternative and baseline costs. The range of possible cost estimates for a particular cell and the chance any particular value is likely to occur are defined by a probability distribution, similar to that shown in Figure 4-5.

For any cost value along the X-axis of this graph, the chance, or probability, that it will occur is shown by the height of the distribution curve. Thus, extremely low- or high-cost values are assigned lower probabilities of occurring than values near the center of the range. Note also that the distribution assumes that actual costs can be much greater than the expected cost, but usually not much less than predicted. For example, a piece of equipment is estimated to cost $100,000 dollars. However, the actual price may range from a high of $145,000 ($45,000 greater than expected) to a low of $88,000 (only $12,000 less than

anticipated). The cost distribution (called a lognormal distribution) assumes that the chance of cost overruns is much greater than the chance of cost "underruns."

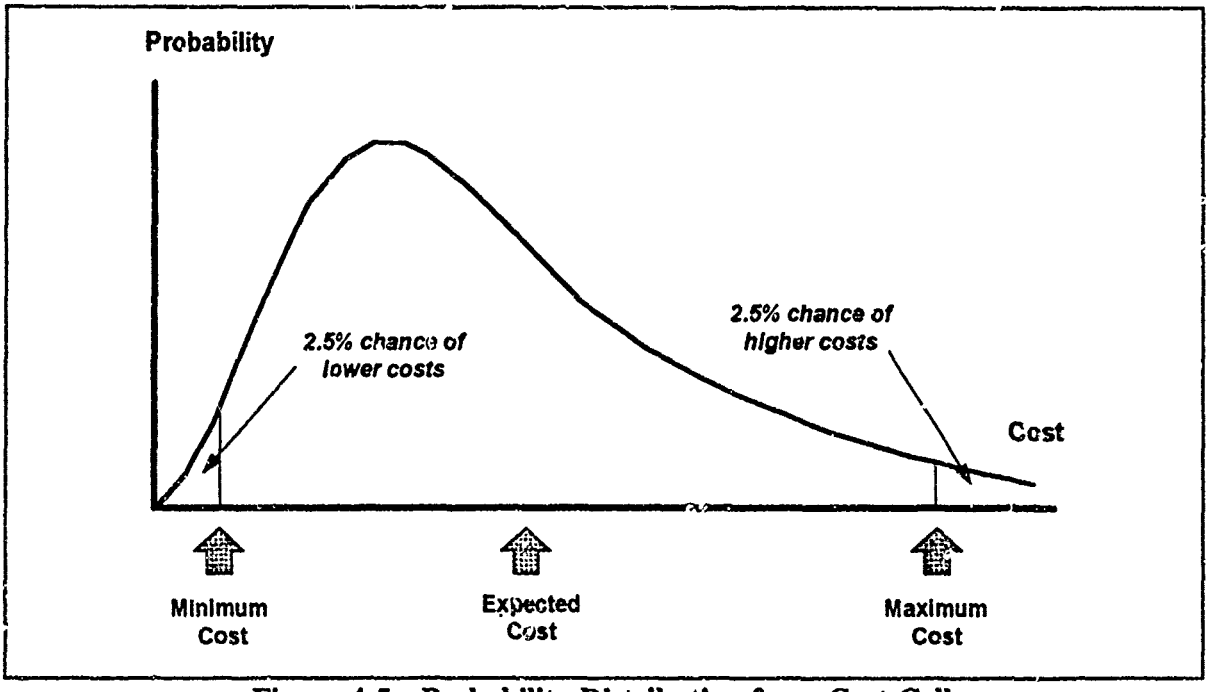

Figure 4-5. Probability Distribution for a Cost Cell

To specify the range of cost estimates to be used by the model, enter a low- and high-cost estimate for each cost cell associated with the alternatives.[6] Formally, the low estimate should be set so that costs below this value are expected to occur only 2.5% of the time, as shown in Figure 4-5. Similarly, costs above the high value should occur only 2.5% of the time. In practice, simply ask what are the best-case (lowest) and worst-case (highest) cost estimates for each cost cell.

To answer this question, it may be helpful to focus first on the range of investment costs and cost savings associated with the individual *initiatives* included in an alternative.[7] Then use these ranges to estimate how total function costs might vary under the alternative.

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[6] The risk analysis procedure in the FEA Model assumes that baseline costs are known with certainty. You can impose the certainty assumption on cost cells for the alternatives by setting the high and low values equal to each other.

[7] In *The Business Value of Computers* (New Canaan, CT: Information Economics Press, 1990), page 205, Paul Strassmann suggests cost ranges that are appropriate for assessing the risk associated with initiatives involving information technology investments.

In any case, the help of the functional working group that developed the alternatives is essential in deriving good estimates of the risk associated with each alternative.

With the cost ranges specified, the FEA Model uses a simulation approach to calculate financial indicators, such as the discounted present value of the savings associated with a particular alternative. For each iteration of the simulation, the model randomly selects a cost value for each cell using the cost distribution to define the odds of selecting a particular estimate. The selected values are then used to calculate a savings estimate. This process can be repeated from 100 to 500 times. Using a small number of iterations is advisable for preliminary estimates because the model will run faster. Final estimates should use the maximum number of iterations, because the accuracy of the simulation process increases with the number of iterations.

4.4 Discounting Costs

This section introduces the concept of discounting, the second technique used in calculating RADCF values, and provides guidelines on choosing a discount rate.

What is Discounting?

When evaluating the cost performance of an alternative relative to the baseline, the analyst is comparing two streams of costs that unfold over time. Suppose that Alternative A generates savings this year of $100 while Alternative B produces more savings, $105; but these savings are not received until next year. Which is the better choice?

Choosing the alternative that simply produces more dollar savings is incorrect because this procedure ignores the time value of money. A $20 bill is worth more if received today, rather than a year from now, because there is the opportunity to invest the money today and receive more than $20 in a year. Similarly, the $100 in savings from Alternative A is worth more than the $105 savings received next year if the government can earn more than 5% annually on its financial investments. At 10%, for example, the *future value* of the $100 would be $110, more than the savings from Alternative B in the second year.

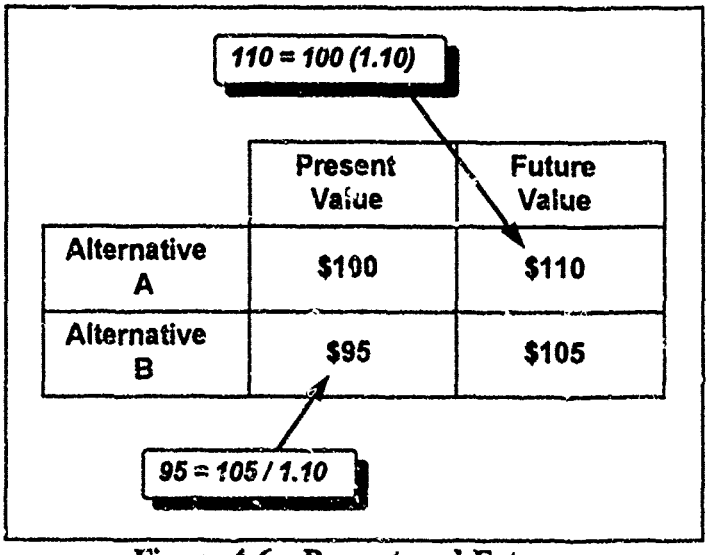

Figure 4-6. Present and Future Value of Savings

As shown in Figure 4-6, we would come to the same conclusion if we focused on the *present value* of the savings. The savings from Alternative B next year are equivalent to receiving $95 in savings this year, less than that generated by Alternative A. Converting future dollars into their equivalent present value is called *discounting*, and the rate at which the conversion is calculated is called the *discount rate*.

Choosing a Discount Rate

The analyst can vary the discount rate used by the FEA Model. The model expects a *real* discount rate, the type of discount rate appropriate for constant dollar cost estimates, like those entered into the FEA Model.

Discounting policy is also typically specified in "real" terms. Current Office of Management and Budget (OMB) policy requires that a 10% real discount rate be used in economic analysis studies for the federal government, and this is the default value in the FEA Model. This OMB policy is being rewritten; and the draft guidance calls for lower real discount rates, from 4% to 7% depending on the application.[8] To illustrate the effect of discounting, Appendix E shows the present value of one dollar received from 1 to 20 years in the future, assuming discount rates of 7% and 10%.

[8] According to the draft of Circular A-94 dated 7/17/92, the 7% real rate is for evaluating the effect of government regulations on the private economy. Other analyses are directed to use rates tied to Treasury bond rates, representing the cost of government borrowing.

4.5 Using FEA Model Results

Congratulations! You've survived the details of cost analysis and can produce the required graphs and financial indicators using the FEA Model. The question that naturally arises now is how to use this information in selecting the best alternative.

The financial information produced by the FEA Model, as shown on the next page for the example, helps answer the following four questions about the alternatives:

- *What are the savings in function costs?* Use the expected RADCF savings results shown on the summary graph to rank the alternatives by their potential savings. This is the best overall measure of savings because it is the mean, or average, of the distribution of possible savings results generated by the risk simulation.

- *What is the risk associated with the savings estimates?* This is shown by the high and low RADCF values, which are also reported on the summary graph of the FEA Model. Alternative A is clearly superior to Alternative B in producing savings if A's low RADCF savings are greater than B's high estimate. Of course, clear rankings like this will not always result, but the range of RADCF values by alternative can still be used to evaluate the relative riskiness of the alternatives being considered.

- *Is there an increase in managerial efficiency?* An alternative that increases the tooth-to-tail ratio is probably doing more with less management overhead, thereby supporting the principal objective of the Defense Management Review. Tooth-to-tail ratios are displayed by fiscal year on several of the graphs produced by the FEA Model.

- *Is an alternative affordable?* Comparing the total costs for an alternative with the costs in the current FYDP can determine whether the alternative will fit within current funding constraints. If an otherwise good alternative departs from the budget targets, the action plan can be restructured to affect the timing of investment costs and cost savings.

FEA Example

Cost Comparison. RADCF savings were calculated using 14 residual years and a discount rate of 7%. Figure C-9 shows the resulting summary graph from the FEA Model. Alternative A has expected savings over the 20 year analysis period of $1,573 M, as compared with $89 M for Alternative B. The risk analysis shows that, even under worst case assumptions, Alternative A should yield savings. For Alternative B, however, there is a significant probability that costs will actually increase relative to the baseline.

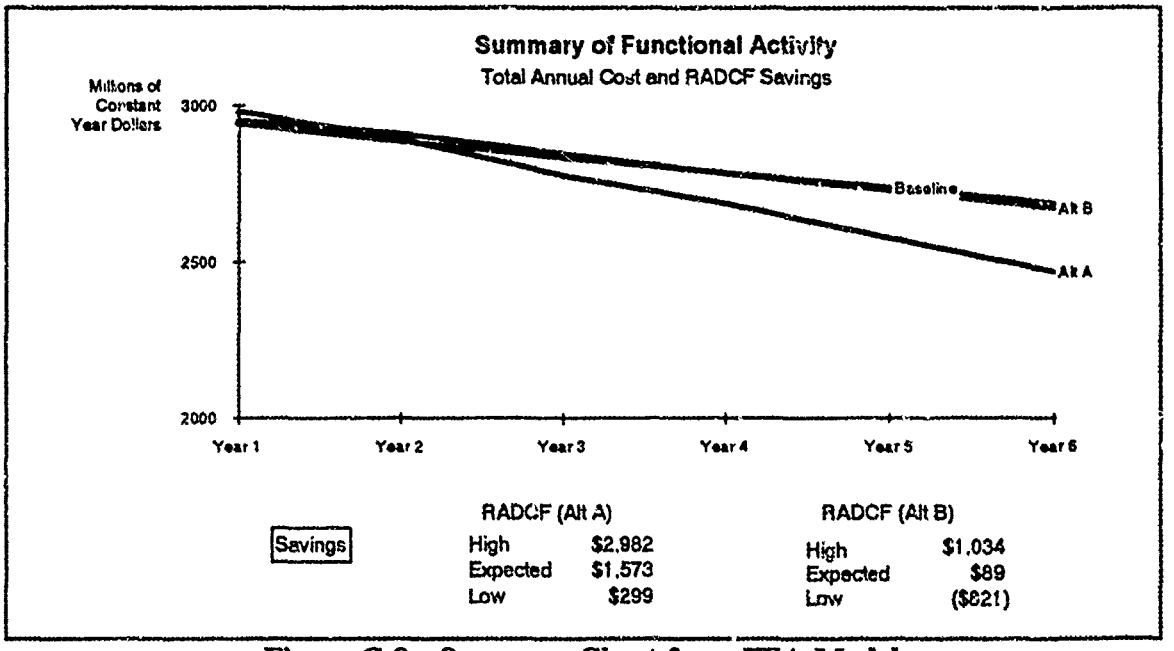

Figure C-9. Summary Chart from FEA Model

Figure C-10 shows the expected tooth-to-tail ratio for the baseline and alternatives in the steady-state. Alternative A increases the ratio of operations to management and support costs for the function relative to the baseline. Because of the nature of the changes proposed in Alternative B, the proportion of operations costs actually decreases compared to the baseline.

Baseline	Alternative A	Alternative B
7.32	7.77	4.82

Figure C-10. Tooth-to-Tail Ratios

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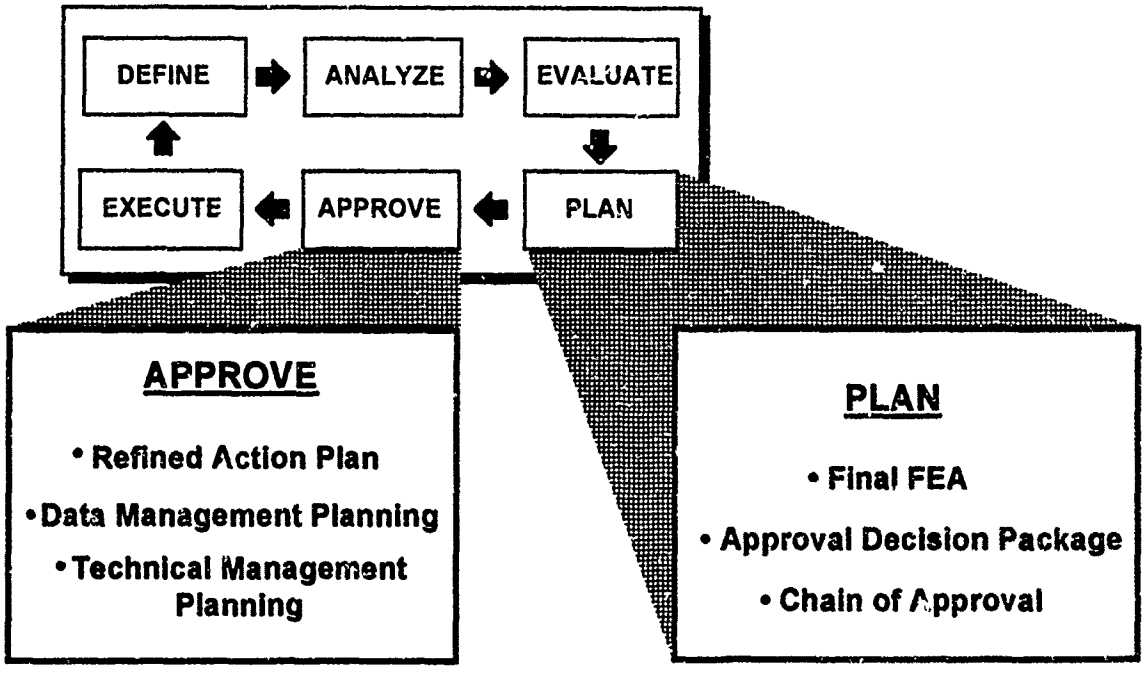
MODULE 5:

Packaging the FEA for Approval


DEFINE
ANALYZE
EVALUATE
EXECUTE
APPROVE
PLAN
APPROVE
• Refined Action Plan
• Data Management Planning
• Technical Management Planning
PLAN
• Final FEA
• Approval Decision Package
• Chain of Approval

5.1 Module Objectives

The FEA is intended to be a carrier-level document containing not just the results of the economic analysis, but also synopses of strategic plans, data and technical management planning, descriptions of alternatives, and other supporting information. The goal is to combine in one package the functional, technical, and economic analysis required to make optimum decisions.

The FEA is a "living" document that progresses through three distinct stages—Preliminary, Final, and Update. The Preliminary FEA reports on a rough assessment of proposed alternatives based on readily available information. The Final FEA contains a more detailed analysis of the high-potential alternatives based on a refinement of the cost, benefit, and schedule data that were included in the Preliminary FEA. During execution of the approved alternative, the Update FEA acts as a periodic progress report providing a status review on the action plan, costs, performance, and workload. The Update FEA provides decision monitoring information and is used for program evaluation at key decision points. In this regard, the FEA serves as a management and budget analysis tool to determine and monitor the actual costs and benefits of the selected alternative.

This module describes the content of the FEA document, the progressive FEA stages, and the FEA review and approval process. Although this module addresses OSD-level requirements, it is still provides useful information for those preparing lower level FEAs.

At the completion of this module, you will be able to:

- Describe the eight sections of the FEA.
- Describe the progressive stages of an FEA: Preliminary, Final, and Update.
- Understand the FEA review and approval process.

Key Terms in This Module:

Approval Decision Package
Evaluation Decision Package
Final FEA
Preliminary FEA
Update FEA

5.2 FEA Document Contents[1]

DoD has prescribed in DoD 8020.1-M a standard format for documenting the selection, calculation, and presentation of cost and benefit data. This common format should help the functional manager more easily understand the information presented and to compare competing FEAs when decisions have to be made among them. Appendix C provides a sample FEA document for reference.

Preliminary and Final FEAs should contain the eight sections as shown in Figure 5-1 and described below.

Section 1: Functional Area Strategic Plan Summary

Section 2: Functional Activity Strategic Plan Summary

Section 3: Functional Activity Performance Targets and Measures

Section 4: Proposed Functional Activity Improvement Program

Section 5: Economic Analysis of Proposed Process Improvement Program

Section 6: Data Management and Information System Strategy

Section 7: Data and System Changes

Section 8: Data and System Cost Analysis

Figure 5-1. FEA Document Contents

Section 1: Functional Area Strategic Plan Summary

Content This section briefly describes the strategic plan for the entire functional area. The purpose of the Functional Area Strategic Plan is to provide functional direction for

[1] Office of the Assistant Secretary of Defense, *Functional Process Improvement*, DoD 8020.1-M, 8/92.

all organizations reporting to the OSD Principal Staff Assistant. The strategic plan defines the major actions that will be taken across the entire functional area, over the next 10+ years, to achieve the area's functional objectives. This description includes:

- Functional planning activities and responsibilities.
- Defense Management Review fiscal adjustments in the functional area.
- Implementation of Defense Management Review decisions.
- Life-cycle management of the functional processes, information resources, and information systems for which the OSD Principal Staff Assistant is responsible.

Source The Functional Area Strategic Plan Summary can be provided by the OSD Principal Staff Assistant.

Section 2: Functional Activity Strategic Plan Summary

Content This section briefly describes the functional activity section of the Functional Area Strategic Plan. This description includes:

- A brief description of the functional activity to provide background for the FEA reader. This could include an IDEF AS-IS text diagram, a high-level node chart of AS-IS model, or a reference to AS-IS model from the FPI workshop document.
- How process improvement within the functional activity supports the functional area objectives, including Defense Management Review (DMR) operational and financial objectives.
- Identification of DMR adjustments to be met through functional activity process changes.

Source The Functional Activity Strategic Plan Summary can be provided by the functional manager.

Section 3: Functional Activity Performance Targets and Measures

Content This section includes:

- Explicit identification of quantifiable performance measures established for the functional activity; these measurements become the basis for benefits tracking (for a detailed description of performance measures, see Section 2.3).

- Identification of the performance objectives for each measure: the current performance and the objectives at the 6- and 10-year marks (for a detailed description of performance objectives, see Module 2).

Source The Functional Activity Performance Measures are obtained from the Functional Activity Strategic Plan and may be augmented by the functional manager's joint functional/technical team. The Functional Activity Performance Objectives are derived from FPI analysis.

Section 4: Proposed Functional Activity Improvement Program

Content This section includes:

- A summary description and explanation of each alternative being evaluated.

- An explanation of how the alternatives support the Functional Area and Functional Activity Strategic Plans (Sections 1 and 2 of the FEA, respectively).

- An explanation of how, quantitatively and qualitatively, the alternatives will contribute to achieving the performance objectives for the functional activity (listed in Section 3 of the FEA).

- A discussion of the risk level for each alternative.

- References to other sources that describe the alternatives in detail (e.g., TO-BE models, action plans, cost information, etc.).

Source The Proposed Functional Activity Improvement Program should be defined by the functional manager's joint functional/technical team. See Module 3 for instructions on developing alternatives.

Section 5: Economic Analysis of Proposed Process Improvement Program

Content This section summarizes the results of the economic analysis, including:

- A list of assumptions used in performing the analysis and their justification (assumptions include discount rate, inflators, deflators, number of residual years, etc.).
- A cost profile of the current functional baseline used in the economic analysis.
- A cost profile of each alternative.
- The FEA Model results.
- The results of other financial indicator calculations (optional).
- Recommendations based on the analysis.

Source The Economic Analysis of the Proposed Process should be completed by the functional manager's joint functional/technical team. Instructions for performing the economic analysis are provided in Module 4 of this guidebook.

Section 6: Data Management and Information System Strategy

Content This section briefly describes:

- The technical strategy to deliver effective data administration and information system support for the functional activity.
- Identification of issues such as decentralized versus centralized data entry/management, data currency and accuracy, data distribution, information and system security, etc.

Source The Data Management and Information System Strategy may be completed by the functional manager, with participation from the Functional Data Administration (FDA) and DoD Component data administrators, the DoD data administration program manager, functional information system manager, and the DISA/CIM Office of Technical Integration.

Section 7: Data and System Changes

Content This section briefly describes the technical changes to data and information system support that will be required to carry out each process improvement initiative.

Source The Data and System Changes Summary may be completed by the Functional Activity Program Manager, with participation from the FDA and DoD Component data administrators, the DoD data administration program manager, functional information system manager, and the DISA/CIM Office of Technical Integration.

Section 8: Data and System Cost Analysis

Content This section includes a cost analysis of data and information system changes for each alternative, at the level of detail required to support Life-Cycle Management (LCM) review of the information system. Where there are acquisitions required, analysis to support the acquisitions should be provided. A summary of costs and benefits for each alternative is included in the economic analysis contained in Section 5 of the FEA. The information in this section is essentially a breakdown of the data and system-related information in Section 5.

Source The Data and System Cost Analysis may be completed by the Functional Activity Program Manager's joint functional/technical team.

5.3 FEA Document Stages

The FEA document evolves through three stages—Preliminary, Final, and Update.

Preliminary FEA

The *Preliminary FEA* is used to conduct an initial "rough order of magnitude" assessment of proposed alternatives to the AS-IS process, data, and system baselines based on *readily available financial information.* The Preliminary FEA estimates the costs, benefits, and risks associated with implementing each process change alternative. The preliminary FEA also includes the estimated costs, benefits, and risks of data standardization changes and information system changes required to support each process improvement alternative. The goal is to identify preferred alternatives, based on costs and risks, that merit more detailed functional, technical, and economic analysis. However, the Preliminary FEA may suggest that no alternative merits further consideration.

The functional manager's joint functional/technical team prepares the Preliminary FEA, with participation from all affected functional and technical staff elements (including the Director of Defense Information (DDI) Functional Information Manager).

The Preliminary FEA is presented as part of an *Evaluation Decision Package* that also includes activity models, data models, and other appropriate information. The functional manager, the approval authority, decides which process improvement changes, if any, offer sufficient potential benefits to warrant additional detailed planning. Preliminary FEAs do not require review outside the staff of the functional manager.

Final FEA

The *Final FEA* contains a more precise analysis based on a refinement of the cost and schedule data that were included in the Preliminary FEA and takes into account information from data management and technical management planning. The degree of precision in a Final FEA is determined by the magnitude of the decision it supports, and the requirement for confidence in the results of the evaluation. The scope, number of options, and complexity of analysis will determine the level of effort applied to develop the FEA.[2]

The functional manager's joint functional/technical team prepares the Final FEA and assembles the Approval Decision Package. The *Approval Decision Package* is an integrated

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[2] DoD 8020.1-M refers to the low level-of-detail FEA as an *Abbreviated* FEA and the high level-of-detail FEA as a *Comprehensive* FEA.

set of documents that consists of the Final FEA, data management and technical management planning documents, and appropriate recommendations.

Both functional and financial managers should validate all FEAs. Functional managers validate the complete document, i.e., the need for the investment, discussion of alternatives, completeness of the financial information (both costs and cost savings), measurement and reporting methods and schedules, and verification that anticipated benefits can be measured and do not duplicate benefits projected from actions external to the activity being analyzed, including benefits addressed in other FEAs. Financial managers validate the accuracy of the financial data and assumptions used in the economic analysis.

The functional manager secures all necessary advance coordination and forwards the Approval Decision Package to the Functional Steering Committee (FSC) for review. After the package is reviewed by the FSC, the functional manager then submits it for OSD PSA approval. The OSD Principal Staff Assistant is the approval authority for the Final FEA and the Approval Decision Package.

The OSD Principal Staff Assistant's approval provides the necessary authority to proceed with implementation of the recommended process improvement alternative. However, the automated information system changes that are part of that alternative must still be approved in an LCM milestone review. The FEA is an essential part of the System Decision Paper that is provided for approval of those AIS changes.[3]

Update FEA

After an alternative is selected and approved, the functional manager will monitor its progress during execution through the Update FEA. The Update FEA is not an economic analysis in itself but a periodic progress report on the Final FEA's approved alternative through which actual costs and performance improvements (based on performance measurement) are compared with those projected. It is the management control mechanism that indicates whether the anticipated cost savings and performance objectives are being met as scheduled.

The Update FEA will provide current decision monitoring and oversight information for managers conducting program evaluation at key decision points (e.g., POM budget defense, LCM milestone review, Congressional program review) to determine if any redirection is appropriate.

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[3] See DoDD 8120.1 for further details.

The Update FEA includes:

- A review of the functional planning status (e.g., an assessment of the action plan, costs, performance, and workload relative to Final FEA predictions).
- A discussion of the impact/effects of any significant, unanticipated changes in action plan, costs, performance, or workload.
- A discussion of any program adjustments that need to be made.

When cost savings and performance improvements are being achieved as planned, the original decision need not be revisited, unless, of course there is a significant funding or workload change. However, if costs are escalating, milestones are being delayed, or performance improvements are not being realized, a review should be held to reevaluate the original program. If benefits are being realized faster than anticipated, an additional commitment to the alternative may be considered, such as investing more resources to accelerate the implementation schedule.

5.4 Questions and Answers

What is the appropriate length for an FEA?

The level of detail in an FEA is determined by the magnitude of the decision it supports and the requirement for confidence in the results of the evaluation. The scope, number of options, and complexity of the analysis will determine the required length. In general, Preliminary FEAs should be 10-15 pages long. Final FEAs could extend to approximately 30 pages. Backup material that supports information presented in the FEA should not be included. For example, copies of spreadsheet data used as input to the FEA Model should be referenced but not incorporated into the FEA.

What triggers an Update FEA?

An Update FEA is triggered by a significant change in the program's risk, costs, benefits, or analysis assumptions. An Update FEA can also be required to support periodic POM budget defense or an LCM milestone review. The functional manager will decide, based on the revised information in the Update FEA, whether to cancel, continue, or redirect the program.

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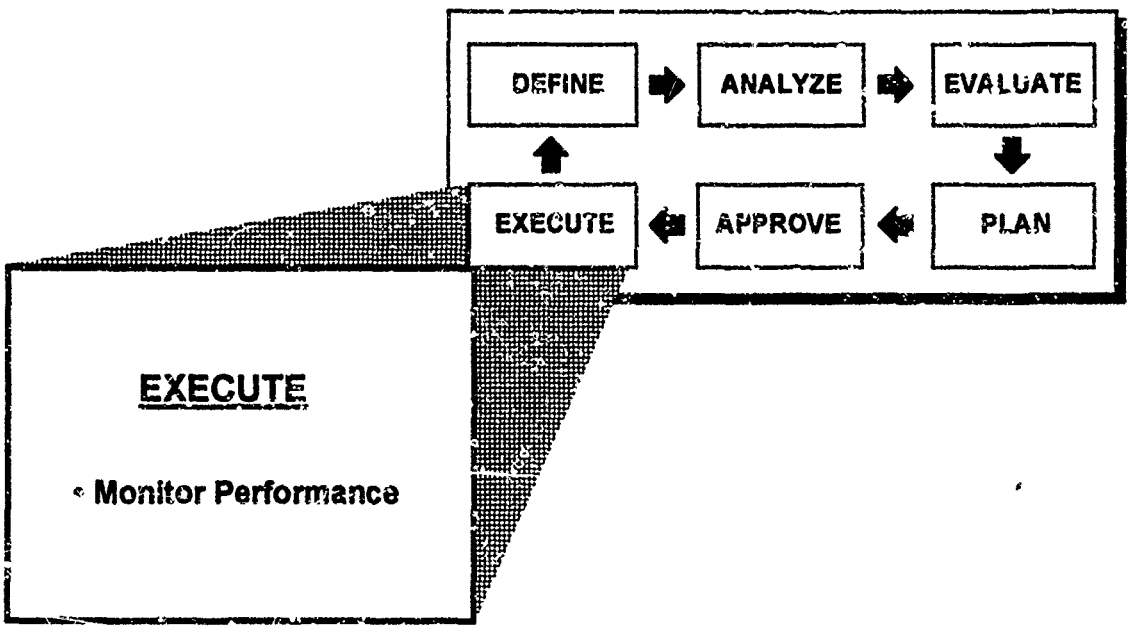
MODULE 6:

The Next FEA Iteration


DEFINE
ANALYZE
EVALUATE
EXECUTE
APPROVE
PLAN
EXECUTE
• Monitor Performance

6.1 Module Objectives

After the OSD Principal Staff Assistant reviews the decision package and approves an alternative, the process, data, and system changes associated with the selected alternative are implemented. However, the FEA does not get put on the shelf at this point. The FEA is an ongoing management tool through which actual costs and benefits are compared with those projected. Through the Update FEA, the realization of cost savings can be monitored and audited. In this sense, it supports the execution step in the FPI cycle. The revised information provided by Update FEAs empowers the functional manager to make effective decisions at any point in the program.

The approved alternative becomes the new baseline and provides the basis for the next cycle of Functional Process Improvement. Functional objectives are reviewed and revised as appropriate. Activity costing analysis of the new AS-IS process may be performed to find high-cost activities. Root cause analysis of the high-cost activities can yield new improvement opportunities and lead to the next FEA cycle.

At the completion of this module, you will be able to list the activities associated with maintaining and monitoring the new functional baseline.

Key Terms in This Module

Actuals
Variances

6.2 Monitor Benefits Realization and Performance Measures

When the selected alternative is approved, it becomes the new functional baseline. The process, data, and system changes associated with the approved alternative are implemented. However, cost and performance estimates contain forecast errors. The further into the future the estimates extend, the less accurate they are likely to be. Therefore, it is crucial to maintain and refine baseline costs, benefits, and risk estimates as more accurate information becomes available. Because the new baseline is the basis for future process improvement, having an up-to-date assessment of baseline cost and performance will facilitate rapid production of FEAs in the future. Accurate baseline information will also help the functional manager make budget projections and sound decisions regarding the future of the program.

To maintain the functional baseline, data must be continuously collected as implementation occurs. These data should include activity model changes, costs, workload projections, and performance measures. For example, as time passes, previous estimates of costs and benefits in the original FEA will become more firm. As they are validated or corrected, the financial risk associated with the initial estimates will lessen (the statistical distribution around the expected value will shrink). In addition, certain required technologies may have matured in the interim, thus reducing the technical risk. These changes should be periodically incorporated into the functional baseline.

During execution of the selected alternative, the functional manager's team should continuously track actual costs, workloads, and performance measures versus estimates. Furthermore, the team should also monitor project status for changes in risk and review assumptions that were used in the financial calculations to see if they are still valid. Following implementation, cost and performance monitoring should continue as benefits are still accruing.

As it monitors the program, the team should evaluate variances between the actuals and estimates. Variance tracking will indicate whether savings and performance improvements are meeting expectations. The OSD PSA may specify an allowable "tolerance band" for expected costs and performance measures. Such a tolerance band may be defined as the range between high and low savings estimates entered in the FEA Model. If actual costs or performance measures start to fall outside the tolerance band in a direction that indicates the benefits are less than planned, the functional manager should investigate the cause. If there is no obvious corrective, action on the program will need to be redirected or canceled. However, if actual costs or performance measures start to fall outside the tolerance band in a direction that indicates the benefits are greater than planned, the OSD PSA may decide to accelerate the program and devote more resources to it to reap more benefits sooner. A simplified example of variance tracking is depicted in Figure 6-1.

If there is a significant increase in program risk versus original estimates or if assumptions used to calculate financial indicators turn out to be invalid, the future of the program may also be reevaluated. For example, the assumption of the discount rate used in the economic analysis would become invalid if there were a dramatic shift in the actual discount rate. If the discount rate changed to the point where the RADCF savings results, based on the actual discount rate, favored an alternative other than the one selected, the original decision could be revisited. A major delay in the projected Action Plan schedule may substantially change the risk and cash flow assumptions. In instances such as these, the findings should be documented in an Update FEA (described in Module 5).

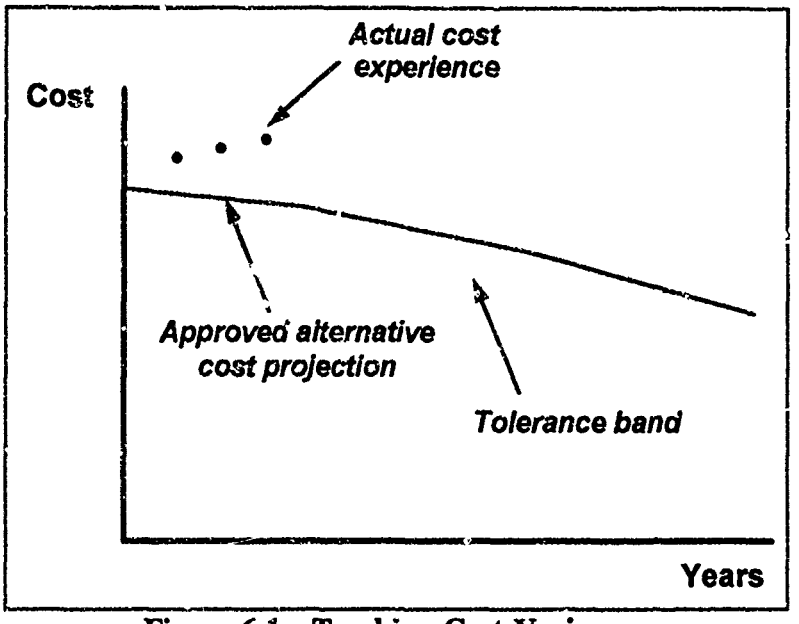


Figure 6-1. Tracking Cost Variances

Finally, if the original decision criteria change, an Update FEA may be desirable to support program redirection. For instance, if the DoD budget scenario changes, the decision criteria for a given FEA might change from RADCF savings to low risk, quick payback. In this instance, new parameters such as discounted payback period might need to be calculated (see Module 4 for details) and included in an Update FEA for management review.

6.3 Questions and Answers

Should performance monitoring continue after implementation?

Yes, because often the bulk of the benefits accrue after implementation is complete and need to be tracked to ensure that all functional objectives are met.

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Appendices

APPENDIX A: Glossary

ACTION PLAN - The schedule for integrating and implementing a given alternative's slate of initiatives (also called implementation plan).

ACTIVITY - A named process, function, or task that occurs over time and has recognizable results. Activities use up assigned resources to produce products and services.

ACTIVITY BASED COSTING - An accounting technique that allows an enterprise to determine the actual costs associated with each product and service produced by that enterprise without regard to the organizational structure of the enterprise.

ACTIVITY COST - The total of all costs (both fixed and variable) expended in performing an activity for a time period.

ACTIVITY MEASURE - A performance value assigned to an activity's primary output.

ACTIVITY MODEL - Model of the processes that make up the functional activity showing inputs, outputs, controls, and mechanisms through which the processes of the functional activity are (or will be) conducted.

ACTIVITY OUTPUT - The primary product, service, or outcome of performing an activity.

ACTUALS - The true value of a cost or performance measurement realized during program implementation.

ALTERNATIVE - A slate of initiatives that can achieve a functional activity's desired TO-BE state.

APPROVAL DECISION PACKAGE - An integrated set of documents that consists of the Final FEA, data management and technical management planning documents, and appropriate recommendations. The OSD Principal Staff Assistant is the approval authority for the Approval Decision Package.

BASELINE - The *initial baseline* is the financial profile of the funds needed to satisfy current and future workloads. An *approved baseline* is an approved plan describing the resources needed, using current processes and reflecting pending changes, to satisfy current and future workloads.

BENEFITS - Outputs or effectiveness expected to be received or achieved over time as a result of implementing an alternative. Monetary benefits are normally an in-flow of cash, such as revenues. Within the FEA context, monetary benefits are cost savings

(see Cost Savings). Benefits can be quantifiable in terms of dollar value or some other measure of productivity, or non-quantifiable as in the case of intangible effects such as increased morale.

CAPITAL ASSET - Assets of a permanent character having continuing value. Examples are land, buildings, and other facilities, including equipment.

CIVILIAN LABOR - Cost element in the FEA Model. Defined in the FEA Model user's manual as the total civilian pay cost, both gross pay and all personnel benefits (e.g., retirement, health insurance, etc.).

CONSTANT DOLLARS - Estimate in which costs reflect the level of prices of a base year. Cost estimates expressed in constant dollars hold the purchasing power of the dollar unchanged over the analysis period.

COST - A resource input to a project, program, or activity expressed in dollar terms.

COST DRIVER - A factor that causes a cost to be incurred.

COST ELEMENTS - Specific resource inputs to projects, programs, or activities. For FEA cost elements see: Civilian Labor, Military Labor, Information Technology, Facilities, Material, and Other.

COST SAVINGS - Difference between the costs of the current course of action (Baseline) and the costs of a proposed course of action (Alternative).

CURRENT DOLLARS - Convention used to show the purchasing power of the dollar in the year costs or cost savings are incurred.

DISCOUNTING - The process of converting future dollars into their equivalent present value, reflecting the time value of money.

EVALUATION DECISION PACKAGE - The formal decision document that includes the Preliminary FEA, activity models, data models and other any other appropriate information required for the functional manager to make a preliminary evaluation of the proposed alternatives.

FACILITIES - Cost element in the FEA Model. Defined in the FEA Model user's manual as all costs involved in owning, leasing and operating a facility. It would include costs for construction (including modification) if purchased, leasing costs if rented, appropriate utility charges, repair and maintenance, and services. Non-cash charges such as depreciation are excluded.

FINAL FEA - The revision to the Preliminary FEA that is included in the Approval Decision Package. It contains a more detailed analysis based on a refinement of the cost, benefit, and schedule data that were included in the Preliminary FEA.

FUNCTION - Appropriate or assigned duties, responsibilities, missions, tasks, powers, or duties of an individual, office, or organization. A functional area is composed of one or more functional activities, each of which consists of one or more functional processes. Functional area encompasses the scope (the boundaries) of a set of functions for which the OSD Principal Staff Assistant or Chairman, Joint Chiefs of Staff, has DoD-wide responsibility, authority, and accountability.

FUNCTIONAL DIRECTION - The top-level objectives, measures, and strategies that provide scope and guidance to a functional activity.

FUNCTIONAL ECONOMIC ANALYSIS (FEA) - A structured proposal that serves as the principal part of a decision package for enterprise leadership. It includes an analysis of functional process needs or problems, proposed solutions, assumptions and constraints, alternatives, life-cycle costs and benefits, and investment risk analysis. An FEA is consistent with and amplifies existing DoD economic analysis policy in DoD Instruction 7041.3 (Economic Analysis and Program Evaluation for Resource Management).

FUNCTIONAL ECONOMIC ANALYSIS MODEL - The computer software package provided by DDI for the preparation of FEAs. The package calculates a RADCF savings and the tooth-to-tail ratio.

FUNCTIONAL PROCESS IMPROVEMENT (FPI) - (functional management process for implementing the Defense information management program). The application of a structured methodology to define a function's AS-IS environment; its objective and strategy for achieving those objectives; and a program of incremental improvements made through functional, technical, and economic analysis and decision-making.

IMPROVEMENT OPPORTUNITY - Actionable, potential change that either corrects a process deficiency or implements a best practice.

INFLATION - A persistent rise in the general level of prices over time, which results in a decline in the purchasing power of money. Measured by changes in price indices relative to some base year.

INFORMATION TECHNOLOGY - Cost element in the FEA Model. Represents the cost of hardware (including peripheral equipment), software, and related telecommunications equipment purchased from commercial sources. Non-cash charges such as depreciation and amortization are excluded.

INITIATIVE - A specific set of actions that are based on one or more improvement opportunities.

MANAGEMENT AND SUPPORT - Cost category in the FEA Model. Defined in the FEA Model user's manual as costs other than operational costs. Such costs are considered to be indirectly related to the primary output because they cannot be easily or economically identified with the output. These costs typically support more than one primary output.

MATERIAL - Cost element in the FEA Model. Defined in the FEA Model user's manual as costs associated with purchases of office furniture, equipment (non-computer), and supplies including printing and postage. Non-cash charges such as depreciation are excluded.

MILITARY LABOR - Cost element in the FEA Model. Defined in the FEA user's manual as the total of all officer and enlisted pay, including allowances and retirement.

MODEL - An abstraction of a subject that allows us to answer questions about the subject. A representation of a complex, real-world phenomenon, e.g., an activity model represents a functional activity at some point in time; an FEA model represents activity levels over time.

ONE-TIME COST - Expenditures usually related to the purchase of capital assets or other items that are charged on a non-annual, non-repetitive basis (e.g., an initial training, an initial factory tooling).

OPERATIONS - A primary cost subdivision in the FEA Model. Defined in the FEA user's manual as costs associated with essential functional processes that are directly related to the primary output(s) of a function for its intended customers. Each cost element is broken down further by the two cost subdivisions: Operations, and Management and Support.

OTHER - Cost element in the FEA Model. Defined in the FEA user's manual as costs such as project travel, specific job-related technical training, and transportation that are not covered by any of the other cost elements. Also includes hardware and software maintenance and support, and telecommunications usage costs (not investment). All non-cash charges such as depreciation and amortization are excluded.

PERFORMANCE MEASURE - A factor used to gauge the speed or responsiveness, quality, or cost of a process, input, or output (performance measures are described in Module 2).

PERFORMANCE OBJECTIVE - A quantification of an intended or targeted process, input, or output based on some factor (i.e., performance measure) used to indicate a unit of output.

PRELIMINARY FEA - The principal document in the Evaluation Decision Package. It is used to conduct an initial "rough order of magnitude" assessment of proposed alternatives to the AS-IS process, data, and system baselines based on readily available information.

PRIMARY OUTPUT - That single measurable result of an activity by which the cost of an activity is accumulated.

PROCESS - A chain of activities, which may cross organizational boundaries, that produces a common product.

REAL DISCOUNT RATE - The interest rate used to convert future dollars into present dollars.

RECURRING COSTS - Expenses for personnel, material consumed, operating overhead, support services, maintenance, and other items that are charged annually or repetitively in the execution of a given program or work effort.

RESIDUAL VALUES - Costs that extend beyond the six-year period of data entry allowed by the FEA Model. The sixth year of costs for each alternative and the baseline is repeated based on a number of years specified by the user.

RISK - The possibility that actual future returns (or values) will deviate from expected returns (or values).

RISK-ADJUSTED DISCOUNTED CASH FLOW (RADCF) - A summary measure of annual cash flows using discounting to convert to present value and risk analysis to reflect possible deviation from expected costs or savings.

SUNK COSTS - Unrecoverable past costs incurred before the analysis. They have no significance to the analysis and should not be included.

TOOTH-TO-TAIL RATIO - The dollar magnitude of Operations-related costs divided by the dollar magnitude of Management and Support-related costs.

UNIT COST - The cost expended to produce one instance of an activity's primary output.

UPDATE FEA - A periodic progress report on the Final FEA's approved alternative through which actual costs and performance improvements are compared with those projected. The Update FEA provides updated decision monitoring and oversight information for use by functional managers in conducting program evaluation at key decision points.

VARIANCE - The difference between the actual value of a cost or performance measurement and the value predicted in the FEA.

WORKLOAD - The time-phased, expected, overall output of a functional activity.

APPENDIX B: FEA Example - The Scenario

1. **Introduction.** To begin the Functional Economic Analysis, information from other sources will be required. An assumption in this guideline is that most information will be part of the baseline maintained by the functional manager, not a data call undertaken as part of the FEA process. This appendix describes what these input data could consist of and provides the specific illustrations to be used for the FEA example document that appears in Appendix C of this Guidebook.

The input material consists of the following items, each of which is addressed in detail in this appendix:

- Functional direction, as established by senior functional managers as input to the analysis.

- The results of a process improvement project. The products of this effort include activity models, improvement opportunities, initiatives, alternatives, and action plans intended to meet the objectives prescribed in the functional direction. This project also identifies the costs and benefits of each alternative.

Italicized comments are inserted at various points in the scenario description to assist the reader in interpreting the purpose of input tables and figures.

2. **The Setting.** This scenario is based on a DoD FEA effort, but the presentation is for exposition only. The environment has been simplified, idealized, and extended to illustrate types of situations faced by DoD activities. Readers should concentrate on the information mappings and forms, recognizing that to fully explore a specific function would detract from conveying a way of completing an FEA.

3. **Functional Direction.** The OSD Principal Staff Assistant (PSA) directed that a Functional Economic Analysis be developed for the functional activity of supply. The PSA provided guidance for the functional area of supply to the functional manager, who developed this guidance in greater detail in order to produce functional direction for the functional activity. Functional direction, summarized in Figures B-1 through B-5, has been extracted from the functional area and functional activity strategic plans to serve as the basis for process improvement analysis and planning.

The functional direction includes a description of the current state of the functional activity, and the strategic vision of where the PSA and the functional manager want the activity to be in the future.

Figure B-1 describes the current functional process. This current state of operations is characterized by paper information exchange using the mail system, and by the fact that many retail supply centers initiate procurement actions with individual vendors.

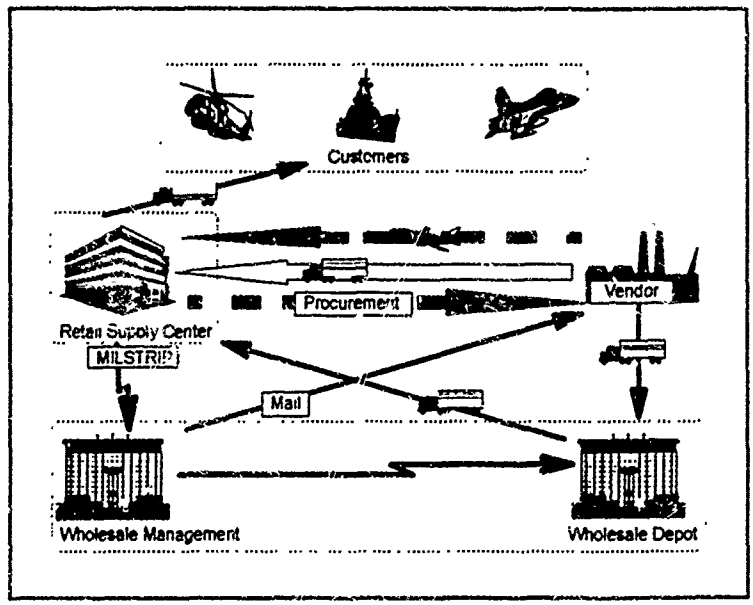

Figure B-1. Functional Direction Current Business Practices

Figure B-2 portrays the TO-BE strategic vision for the functional activity. This future process is characterized by extensive use of electronic data interchange (EDI) throughout the system, by greater reliance on direct shipments to customers, and by major consolidation of procurement actions.

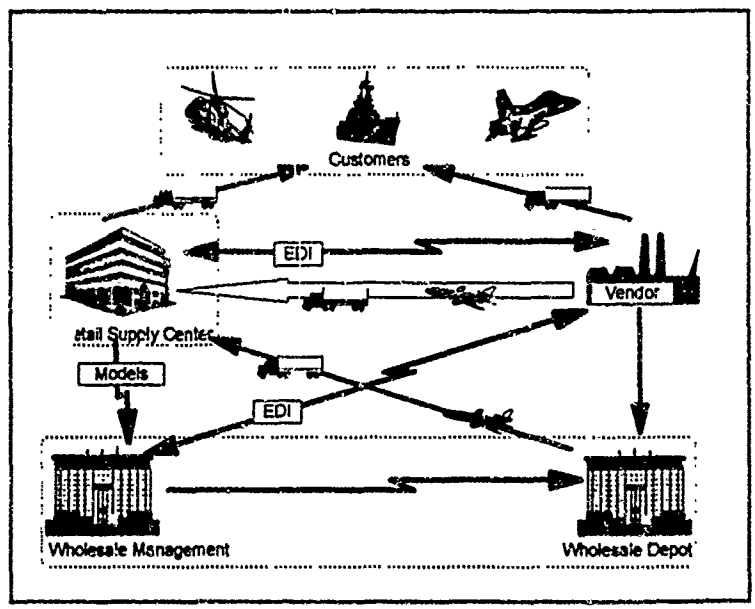

Figure B-2. Functional Direction TO-BE Vision

Figure B-3 provides overall direction. The guidance includes:

- Corporate information management (IM) principles. Supply supports a wide variety of DoD functions. Application of corporate IM principles will ensure that it is fully integrated and contributes to the effectiveness and efficiency of future DoD missions.

General Guidance

Apply corporate IM principles in developing process improvements.

Current Funding ($ millions) *

	FY94	FY95	FY96	FY97	FY98	FY99
DBOF	2,943	2,890	2,840	2,750	2,700	2,600

* These figures reflect the impact of DMRD-imposed reductions.

Current Unit Cost

Cost per Dollar of Sales $ 0.75

Workload Projection (sales -- $ millions)

FY94	FY95	FY96	FY97	FY98	FY99
3,924	3,856	3,793	3,730	3.667	3,604

Figure B-3. Functional Direction Cost and Workload Data

- Dollar funding information. This shows the current funded level for the functional activity. This data is labeled "DBOF" because supply is one of the functional activities that is funded through the Defense Business Operations Fund. This stream of dollars represents customer funding projected for supply, based on data contained in the most recent Future Years Defense Program (FYDP) information, *the official database of the DoD Planning, Programming, and Budgeting System (PPBS)*. The Defense Management Review Decisions (DMRDs) that affect the functional activity have already been

removed. *For a more extensive discussion of the relationships among the PPBS, DMRDs, and functional economic analysis, see Appendix G.*

- Unit cost. This is the current unit cost for the functional activity. In the case of supply, the unit cost measure established by the OSD Comptroller is dollars of cost per dollar of sales handled by the system. *If the Comptroller has established a unit cost measure for a functional activity, the activity must use the established measure as one of its evaluation criteria.*

- Workload projection. The dollar value of sales processed by the supply system is projected to decrease each year. *The workload or output for the functional activity should be measured in terms of customer requirements, not in terms that the functional manager can control. In effect, it should be a given to the functional manager.*

Figure B-4 describes the performance measures for the supply functional activity. Historical information shows that direct contracts with suppliers are clearly more economical than either local purchase or warehouse strategies. The graph illustrates the strategy to handle a greater portion of transactions by filling orders directly, and less by relying on local commercial vendors and warehouse stocks. *This type of direction was based on functional expertise and prior studies showing that changing the mix in such a manner will enable the activity to be performed more effectively, more efficiently, or both.* The bottom portion states the performance measures established for the functional activity. This figure shows the current performance against the measures. A key goal of the supply process improvement effort is to decrease order-ship time and increase direct fill percentage.

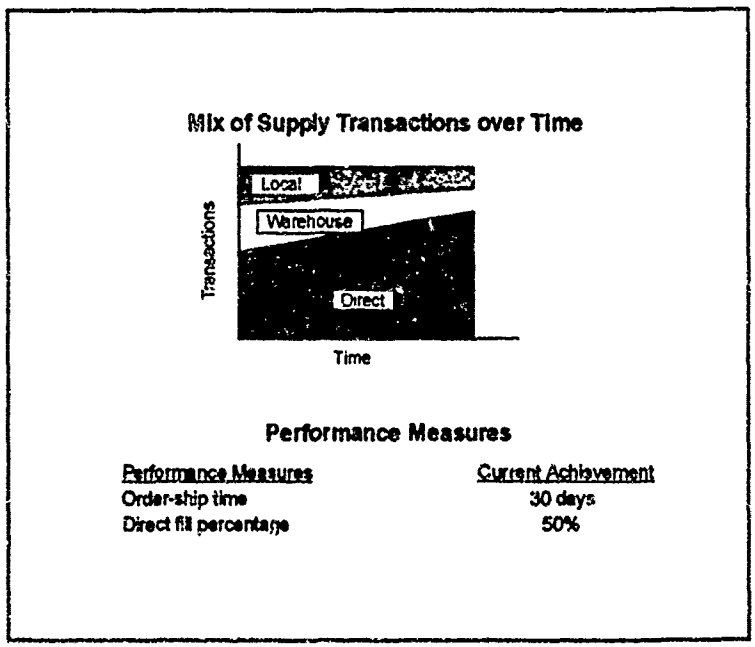

Figure B-4. Functional Direction Performance Measures

Figure B-5 offers the guidance regarding information technology (IT). This guidance

is based on the results of several analyses that were done for the functional activity. These analyses determined that of the nine automated information systems (AISs) now in use or planned for development, two were determined to be candidates for a migration system. These candidate systems are OSD Agency System 898 and MILDEP System 567. Development effort for the other seven AISs is frozen.

System Baseline

Number of AIS in development in all components -- 9

Preliminary System Migration Guidance

Candidates for migration system — OSD Agency System 898; MILDEP System 567

Guidance: Freeze development and modernization on remaining seven AIS.

Strategic Data Guidance

Use data elements identified in high-level study.
Plan for migration to shared data system and mapping of legacy data.
Plan for source data automation.

Figure B-5. Functional Direction Information Technology Guidance

Taken as a package, the functional direction provides criteria against which alternative process improvements will be evaluated.

4. **Baseline Models and Costs.** The functional manager directed the development of the baseline, which comprises an AS-IS model and associated costs, as the basis for process improvement.

AS-IS Activity Model. Figure B-6 shows a node tree for the supply functional activity.

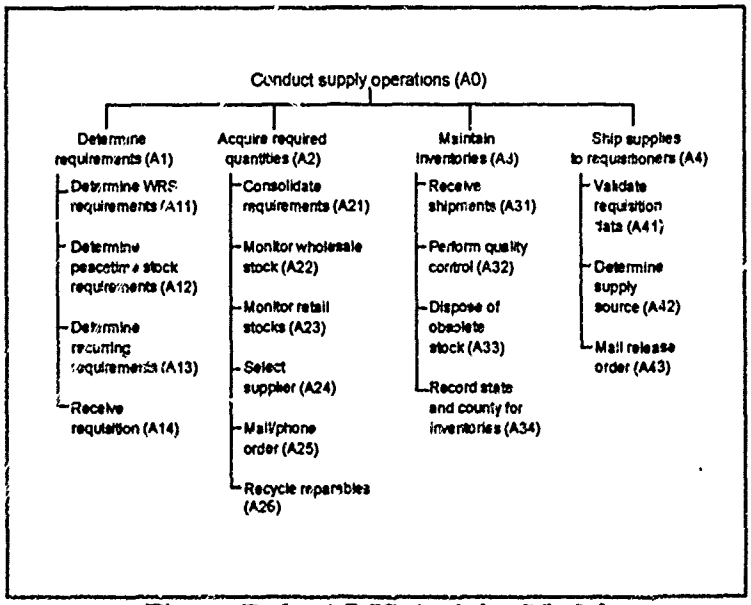

Figure B-6. AS-IS Activity Model

AS-IS Cost Worksheet. Figure B-7 presents the activity costs for supply operations. Actual costs were developed and then allocated to the activities. The most recent actual cost data available were from FY92. These numbers were obtained, then inflated to equivalent FY94 values. This conversion from FY92 to FY94 values produced the bottom-line totals in Figure B-7; these numbers were then allocated to the activities in the AS-IS node tree.

In our example, costs were allocated to the first level of activities. However, these cost worksheets can be used to allocate costs to whatever level of detail the functional manager considers appropriate. Costs could be allocated to the second, third, or lower levels of sub-activities. The general rule is that worksheets should be taken to the level of detail that gives the manager information needed to determine how and where costs are being incurred, so that a meaningful analysis of the activity can be made.

Activity	Personnel	Info Tech	Facilities	Material	Other	Total	Activity Output (K)	Unit Cost ($)	Opns %
Determine Req'mts	10.0	3.0	1.0	2.0	5.0	21.0	150	140	50%
Acquire Quantities	41.0	9.0	1.0	6.0	17.0	74.0	305	243	80%
Maintain Inventory	225.9	4.1	64.2	2,301.3	92.2	2,687.7	5150	522	90%
Ship Supplies	90.0	6.0	1.0	23.0	40.0	160.0	800	200	62%
	366.9	22.1	67.2	2,332.3	154.0	2,942.7	3,924	0.75	

Figure B-7. AS-IS Activity Cost Worksheet ($ millions, except where noted)

The activity output column represents the measured primary output for each activity. Note that the projected output for the overall activity is the FY94 workload that was provided in the functional direction. For most functional activities, as in our example, different units of measure will apply to sub-activities and the overall activity. Therefore, the output for the overall activity (i.e., dollar value of sales) will usually not be the sum of the outputs of the sub-activities; these numbers are not additive.

The unit cost was determined by dividing the total cost on each line by its associated workload.

The final column of the worksheet indicates the percentage of the cost in each sub-activity that is incurred for operations, as opposed to management and support. The percentages were developed by analyzing the cost components of each sub-activity.

The FEA Model, which is discussed in Module 4, calls for separate identification of military and civilian personnel costs. In our hypothetical functional activity, it was determined that military personnel costs were not significant; therefore, in Figure B-7 and all other cost displays, civilian and military personnel costs are combined in one category.

Cost Baseline. Figure B-8 shows the cost baseline. For an initial FEA, the baseline is the cost of accomplishing the known and projected workload, using the existing functional process with no changes. *In other words, the cost baseline in the initial FEA for a functional activity reflects what the activity will cost if the current process is maintained into the future. During preparation of the FEA, the cost baseline will be used as the resource profile against which the costs of various alternatives will be evaluated.*

The cost baseline contains two sections. The top section of the figure shows the day-to-day recurring costs associated with conducting supply operations. The bottom portion shows investment costs. These investment costs represent planned expenditures of procurement dollars to acquire programmed replacements for existing automated systems.

If investments were planned for process improvements, they would be reflected in the bottom section of Figure B-8. However, as explained elsewhere in this publication, the baseline for the initial FEA in a functional activity does not reflect investments for previously planned process improvements.

COST ELEMENT	FY94	FY95	FY96	FY97	FY98	FY99
RECURRING COSTS						
Personnel	366.9	360.2	353.5	346.9	340.2	333.5
Info Tech	7.0	6.5	9.9	13.4	16.8	20.3
Facilities	67.2	66.1	65.0	64.0	62.9	61.8
Material	2,332.3	2,295.0	2,257.7	2,220.3	2,183.0	2,145.7
Other	154.2	145.8	137.4	140.4	142.0	142.0
Total	2,927.6	2,873.6	2,823.5	2,784.0	2,744.9	2,703.3
INVESTMENT COSTS						
Personnel	--	--	--	--	--	--
Info Tech	15.1	18.0	21.0	12.5	5.5	--
Total	15.1	18.0	21.0	12.5	5.5	--
TOTAL COST	2,942.7	2,891.6	2,844.5	2,797.5	2,750.4	2,703.3

Figure B-8. Cost Baseline ($ millions)

In addition to the baseline costs, there currently exist development and modernization costs associated with previously approved plans to invest in a number of IT systems. The systems involved are listed in Figure B-9. In accordance with the functional direction, development effort on these systems has been frozen. The exceptions are OSD Agency System 898 and MILDEP System 567. These are the systems that have been identified as candidates for migration.

MILDEP System 123
MILDEP System 234
MILDEP System 345
MILDEP System 456
MILDEP System 567
MILDEP System 678
MILDEP System 789
OSD Agency System 898
OSD Agency System 876

Figure B-9. AIS Under Development and Modernization

5. **Results of Process Improvement Analysis.** The functional manager convened a group of functional experts, customers, and analysts and developed improvement opportunities, initiatives, alternatives, and associated action plans.

Improvement Opportunities. Figure B-10 summarizes the improvement opportunities for the functional activity. It is projected that it will take five years to fully implement a new functional process at all sites. Because our process improvement begins in FY94, the steady-state year is FY99. Of course, even before full implementation is achieved, incremental improvement will be achieved as various elements of the redesigned process are put in place. The quantification of projected benefits in Figure B-10 was used to focus attention on high-payoff improvement opportunities. In most cases, improvement opportunities will have to be implemented in combination with each other in order to achieve the projected steady-state benefits.

	Improvement Opportunities	Projected Steady-State Benefits
1	Implement just-in-time inventory procedures.	3-5% reduction in unit cost. 10-day reduction in order-ship time.
2	Integrate wholesale and retail logistics operations.	20-day reduction in order-ship time.
3	Minimize low dollar-value contracts.	5% reduction in cost of procurement and contract payment operations.
4	Eliminate requirement to report inventories by state and location (non-value added).	5% reduction in unit cost.
5	Eliminate requirement to validate requisition data (non-value added).	One-hour reduction in requisition processing time.
6	Implement electronic commerce (EC) and electronic data interchange (EDI).	2-3% reduction in unit cost.
7	Implement paperless transaction system.	1-3% reduction in unit cost.
8	Consolidate contract payment operations.	5% reduction in cost of contract payment operations.
9	Implement data sharing/migration.	2% reduction in unit costs

Figure B-10. Improvement Opportunities

Note that two of the improvement opportunities, numbers 4 and 5, are eliminations of non-value added sub-activities in the AS-IS node tree—sub-activities A34 and A41. Elimination of these non-value added activities will be made a part of each alternative that is developed.

The benefits must relate to the functional direction communicated by senior managers. Figure B-10 provides a quantified estimate of how each improvement opportunity will help achieve the performance or cost targets established in the functional direction.

The benefits are projected at steady state, which is achieved when all actions necessary to implement approved improvement opportunities have been completed and the functional activity is operating as intended by the TO-BE models. At steady state, there are no more changes to implement; and the new process is being used. (In practice, process improvement is a continual activity, so there will always be more changes to implement. But for purposes of this example, we are portraying a one-time process improvement.)

Initiatives. Figure B-11 contains the initiatives that implement the improvement opportunities listed in Figure B-10.

Initiatives are the things that must be done in order to make improvement opportunities happen. In practice, the list of initiatives would be more extensive than the list in Figure B-11.

Initiatives	Time	Constraints
Install new system at large facilities.	1 month per site	Must include training time.
Install new system at small facilities.	2 weeks per site	Must include training time.
Prepare letter requesting policy change on inventory reporting.	1 month	
Develop training programs.	6 months	Training to be conducted on-site by in-house personnel.
Build data system.	10 months	Must provide export capability.
Select migration inventory system.	2 months	Must provide export capability. Must be compatible with current LAN.
Develop interface between inventory system and contract payment system.	5 months	
Merge inventory data bases.	4 months	
Develop new policy and procedure documents.	2 months	Joint in-house/contractor team. Must be ready before implementation at first site.
Implement training programs.	1 month per site	Cost negligible if done in-house.
Disseminate information on revised procedures to all users.	Ongoing	Plan an aggressive information program.

Figure B-11. Initiatives

Alternatives. After reviewing the improvement opportunities to determine the extent to which they contribute to the achievement of the objectives established in the functional direction, the alternatives in Figure B-12 were developed for more detailed analysis.

An alternative is a packaging of initiatives in order to achieve a specific set of improvement opportunities. Alternatives are the packages that will be analyzed in detail during the FEA.

Alternative	Title & Description
A	**Centralized Procurement with EC/EDI** Fully implement EC and EDI. Implement at large supply facilities first. Integrate retail and wholesale supply and standardize AIS throughout the system. Maximize buying power by consolidating contracting operations. Eliminate recording state/county data for inventories.
B	**Local Procurement with EC/EDI** Implement EC and EDI at retail level. Capitalize on supply centers' relationships with local suppliers. Eliminate recording state/county data for inventories.

Figure B-12. Alternatives

TO-BE Models. A steady-state TO-BE activity model is provided for each alternative. These are shown in Figures B-13 and B-14.

Each of these alternative node trees calls for the elimination of the non-value added activities identified earlier. Additionally, each of the TO-BE models indicates that activities being done today by mail or by telephone will in the future be done by electronic transmission. These remaining but modified sub-activities are highlighted in dashed boxes.

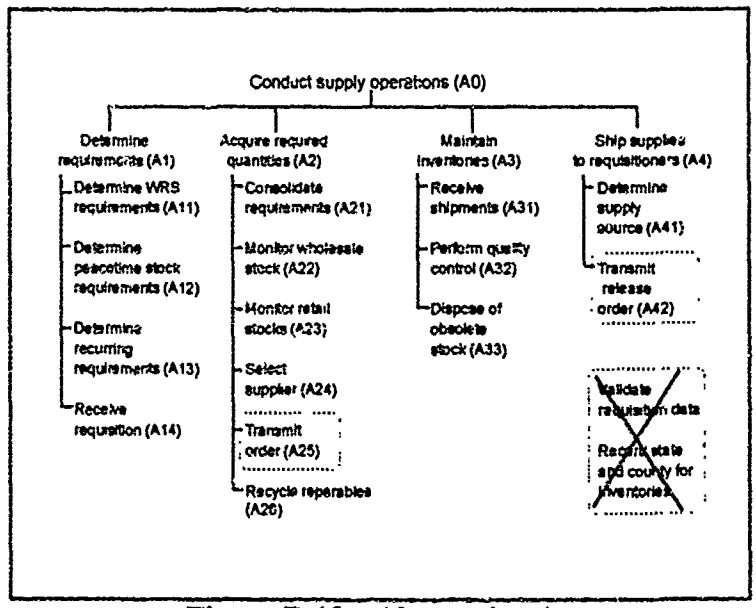

Figure B-13. Alternative A TO-BE Activity Model

The difference between the two alternatives in steady state is that Alternative B, with its increased reliance on local procurement operations, eliminates activity A21, the consolidation of requirements.

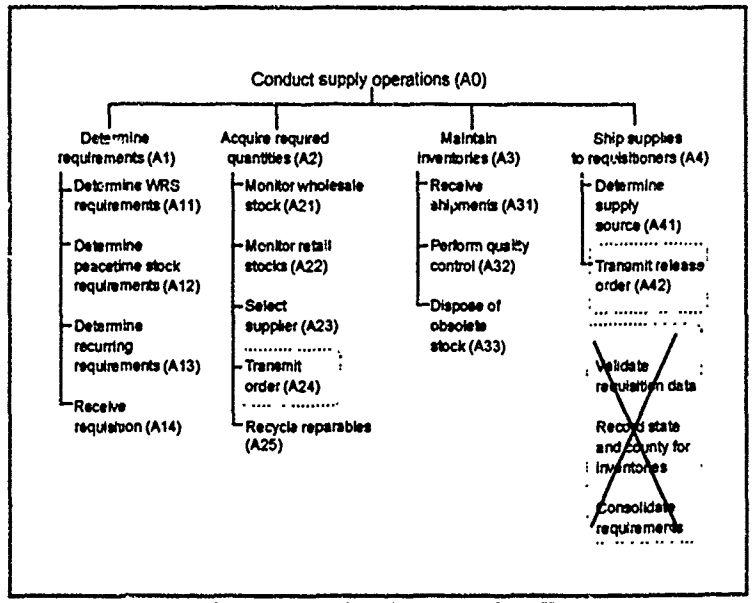

Figure B-14. Alternative B TO-BE Activity Model

Activity cost worksheets were developed for the AS-IS and for each alternative at steady state. Recall that steady state is the condition that exists after all changes necessary to operate under the new process have been fully implemented, which in our example occurs in FY99. The steady-state worksheets are shown in Figures B-15 through B-17. These worksheets reflect the FY99 workload projection from Figure B-3.

Activity	Personnel	Info Tech	Facilities	Material	Other	Total	Activity Output (K)	Unit Cost ($)	Opns %
Determine Req'mts	9.2	2.8	.9	1.8	4.6	19.3	150	129	50%
Acquire Quantities	37.7	8.3	.9	5.5	15.6	68.0	305	223	80%
Maintain Inventory	207.8	3.8	59.1	2,117.2	85.0	2,472.9	5150	480	90%
Ship Supplies	78.8	5.4	.9	21.2	36.8	143.1	800	179	62%
	333.5	20.3	61.8	2,145.7	142.0	2,703.3	3,604	0.75	

Figure B-15. AS-IS Steady-State (FY99) Activity Cost Worksheet ($ millions, except where noted)

Activity	Personnel	Info Tech	Facilities	Material	Other	Total	Activity Output (K)	Unit Cost ($)	Opns %
Determine Req'mts	8.4	2.5	.8	1.7	4.2	17.6	150	117	65%
Acquire Quantities	34.3	7.6	.8	5.0	14.2	61.9	305	203	85%
Maintain Inventory	189.2	3.4	53.9	1,926.6	77.1	2,250.2	2450	918	90%
Ship Supplies	75.3	5.0	.8	19.3	33.5	133.9	400	335	70%
	307.2	18.5	56.3	1,952.6	129.0	2,463.6	3,604	0.68	

Figure B-16. Alternative A Steady-State (FY99) Activity Cost Worksheet ($ millions, except where noted)

Activity	Personnel	Info Tech	Facilities	Material	Other	Total	Activity Output (K)	Unit Cost ($)	Opns %
Determine Req'mts	9.4	2.8	.9	1.8	4.5	19.4	150	129	50%
Acquire Quantities	38.5	8.5	.9	5.4	15.3	68.6	500	137	75%
Maintain Inventory	211.9	3.8	60.4	2,074.9	66.3	2,417.3	5010	482	85%
Ship Supplies	84.5	5.6	.9	20.7	36.1	147.8	800	185	55%
	344.3	20.7	63.1	2,102.8	122.2	2,653.1	3,604	0.74	

Figure B-17. Alternative B Steady-State (FY99) Activity Cost Worksheet ($ millions, except where noted)

Relationships. The specific relationships among improvement opportunities, initiatives, and alternatives are shown in Figure B-18.

To summarize what has been said in previous sections:

- *Improvement opportunities represent changes in inputs, controls, mechanisms, or sub-activities.*
- *Initiatives are the actions required to put improvement opportunities into effect.*

- *An alternative is a packaging of initiatives that will achieve a specific set of improvement opportunities.*

Alternative	Initiative	Improvement Opportunity
Alternative A. Centralized procurement with EC/EDI	Select migration inventory system. Install system at supply centers. Develop training programs. Develop policy and procedure documents. Implement training programs.	Implement just-in-time inventory procedures.
	Merge inventory data bases. Develop training programs. Develop policy and procedure documents. Implement training programs.	Integrate whole and retail logistics operations.
	Merge inventory data bases. Develop policy and procedure documents.	Minimize low dollar-value contracts.
	Prepare letter.	Eliminate requirement to report inventories by state and location.
	Develop policy and procedure documents.	Eliminate requirement to validate requisition data.
	Develop interface between inventory system and contract payment system.	Consolidate contract payment operations.
	Build data system. Merge inventory data bases.	Implement data sharing/migration.
Alternative B. Local procurement with EC/EDI	Select migration inventory system. Install system at supply centers. Develop training programs. Develop policy and procedure documents. Implement training programs.	Implement just-in-time inventory procedures.
	Prepare letter.	Eliminate requirement to report inventories by state and location.
	Develop policy and procedure documents.	Eliminate requirement to validate requisition data.
	Build data system. Merge inventory data bases.	Implement data sharing/migration.

Figure B-18. Relationships among Alternatives, Initiatives, and Improvement Opportunities

Action Plans. An action plan is provided for each alternative, and these are shown in Figures B-19 and B-20. Each action plan shows the time-phased initiatives that will be required in order to implement the alternative and achieve the improved functional process.

As with other elements of this example, these action plans are less complex than would be required in practice.

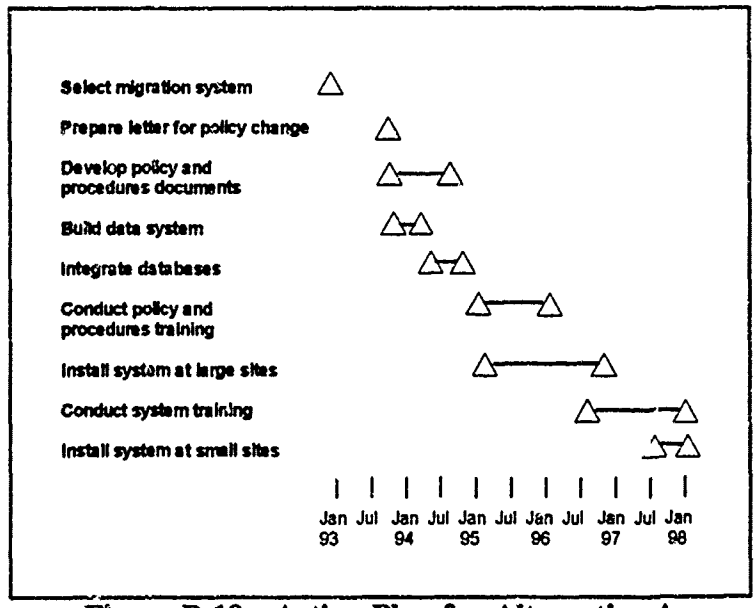

Figure B-19. Action Plan for Alternative A

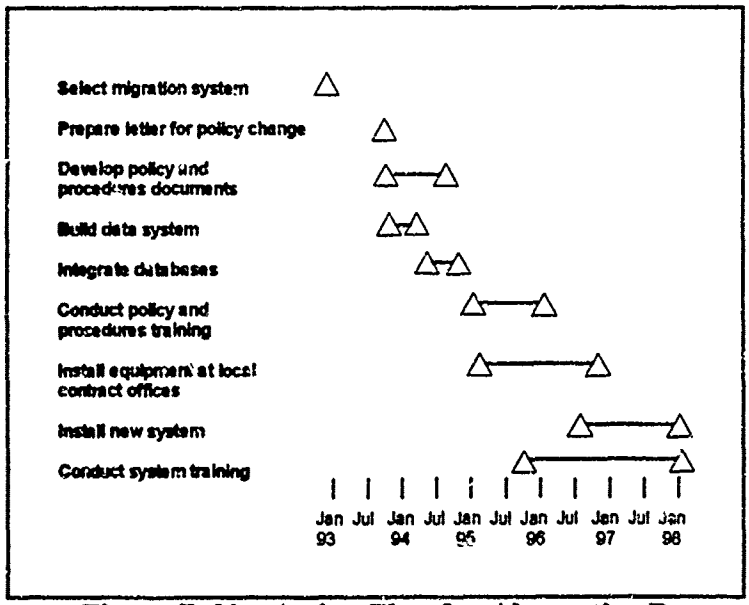

Figure B-20. Action Plan for Alternative B

Benefits. An estimate was made of the extent to which each of the alternatives will satisfy the objectives established in the functional direction. This projection is shown in Figure B-21. Note that each alternative is assessed using each of the objectives prescribed in Figure B-4. The projection shows how the baseline and each of the alternatives will perform at steady state.

Measure	Baseline	Alternative A	Alternative B
Unit Cost (per dollar of sales)	0.75	0.68	0.74
Order-ship Time	25 days	10 days	12 days
Direct Fill Percentage	50%	75%	60%

Figure B-21. Steady-State Comparison of Alternatives

Cost Estimates. For entry into the FEA Model, cost estimates for the baseline and for each alternative were developed. For the baseline, these costs were previously provided in Figure B-8. For Alternatives A and B, the costs are shown at Figures B-22 and B-23, respectively. These tables show the cost of operating the functional process as it is changed over time, and the investment cost associated with the action plan. These data represent the best estimate of costs for the baseline and each alternative.

COST ELEMENT	FY94	FY95	FY96	FY97	FY98	FY99
RECURRING COSTS						
Personnel	366.9	355.0	343.0	331.1	319.1	307.2
Info Tech	22.1	21.4	20.7	19.9	19.2	18.5
Facilities	67.2	65.0	62.8	60.7	58.5	56.3
Material	2,332.3	2,256.4	2,180.4	2,104.5	2,028.5	1,952.6
Other	147.3	128.6	121.2	125.3	127.9	129.0
Total	2,935.8	2,826.3	2,728.1	2,641.5	2,553.5	2,463.6
INVESTMENT COSTS						
Personnel	3.2	2.6	1.9	1.3	.6	--
Info Tech	3.7	18.0	21.0	12.5	5.5	--
Total	6.9	20.6	22.9	13.8	6.1	--
TOTAL COST	2,942.7	2,846.9	2,751.1	2,655.2	2,559.4	2,463.6

Figure B-22. Alternative A Cost Estimates ($ millions)

COST ELEMENT	FY94	FY95	FY96	FY97	FY98	FY99
RECURRING COSTS						
Personnel	366.9	362.4	357.9	353.3	348.8	344.3
Info Tech	22.1	21.8	21.5	21.3	21.0	20.7
Facilities	67.2	66.4	65.6	64.7	63.9	63.1
Material	2,332.3	2,286.4	2,240.5	2,194.6	2,148.7	2,102.8
Other	147.3	127.2	118.5	121.2	122.5	122.2
Total	2,935.8	2,864.2	2,803.9	2,755.2	2,704.9	2,653.1
INVESTMENT COSTS						
Personnel	3.2	2.6	1.9	1.3	.6	--
Info Tech	3.7	18.0	21.0	12.5	5.5	--
Total	6.9	20.6	22.9	13.8	6.1	--
TOTAL COST	2,942.7	2,884.8	2,826.9	2,768.9	2,711.0	2,653.1

Figure B-23. Alternative B Cost Estimates ($ millions)

In addition to these cost estimates, which show the year-by-year cost for the overall activity, activity cost worksheets would also be developed for each alternative and the baseline over time. These worksheets would show how each alternative changes the tooth-to-tail ratio over time. In our example, the year-by-year activity cost worksheets have been omitted.

6. **Other Benefits.** *Benefits realized by functional activities outside the defined baseline are not included in the normal economic analysis. The FEA guidance indicates that these may be considered with greater weight given to those that can be measured. Potential areas for other benefits include:*

- *Favorable variance or ongoing efficiency: Benefits achieved within the functional activity are part of the baseline and regular economic analysis. However, often the same efficiency gains can be exported.*
- *New capability: New capability opens up new avenues for other functions.*
- *Liquidation of assets: New capabilities can eliminate resources in other functions.*
- *Shared resources: New capabilities can be used directly by other functions.*

The following benefits have been identified and quantified for customers (see Figure B-24) outside the supply function:

Take Over Facilities' Small Procurements. The supply procurement efficiencies can be used by facilities for maintenance and minor construction. Agreement has been reached to add that workload with no additional resources. The estimated similar reduction in material cost due to better contracting is 5% of the annual total of $600K or $30K. In addition, one person per large site can take care of all small sites that now have a person doing that function part-time.

Measurement: The total dollar value of facilities will be monitored on a quarterly basis for new sites.

Close Transportation Warehouse and Reduce Inventory. The transportation department will also use the new capability and eliminate three warehouses at a savings of $200K and reduce their inventory of $300K by 20%. The one-time savings is $260K.

Measurement: The closing of the warehouses will be tracked and the inventory level audited after one year.

Benefit	Value	Measurement
Facilities Procurement	5% of $600K = $30K/yr	Monitor facilities volume
Transportation Procurement	$260K - one time	Annual audit
Total	$30K/yr $260K - one time	

Figure B-24. Other Benefits

7. **Detailed Data Management and Information System Analysis.** *In addition to the IT guidance provided in the functional direction, more specific information regarding the management of information systems and data will be available. This material is shown in the following text and figures.*

General Strategy. The general information management strategy for improving the functional process, as diagrammed in Figure B-25, is as follows:

- Move directly to the DISA Utility to supply all ADP services. Develop aggressive level of service agreements to ensure continuous and high-quality services, to include operation of networks, central sites, archives, and EDI/EC implementation. No independent procurements will be initiated. A continuous reduction of ADP support expenses by 12% per year is expected.

- Implement the data model on a standard, off-the-shelf database management system that offers a full range of distribution and reuse capabilities.

- Focus all development on migrating all applications to the data model. Freeze development on other systems.

- Develop a strong infusion of new technology wherever supported by Functional Economic Analyses. These analyses should be streamlined both in preparation and approval, with local management able to make most decisions based on general policy guidance.

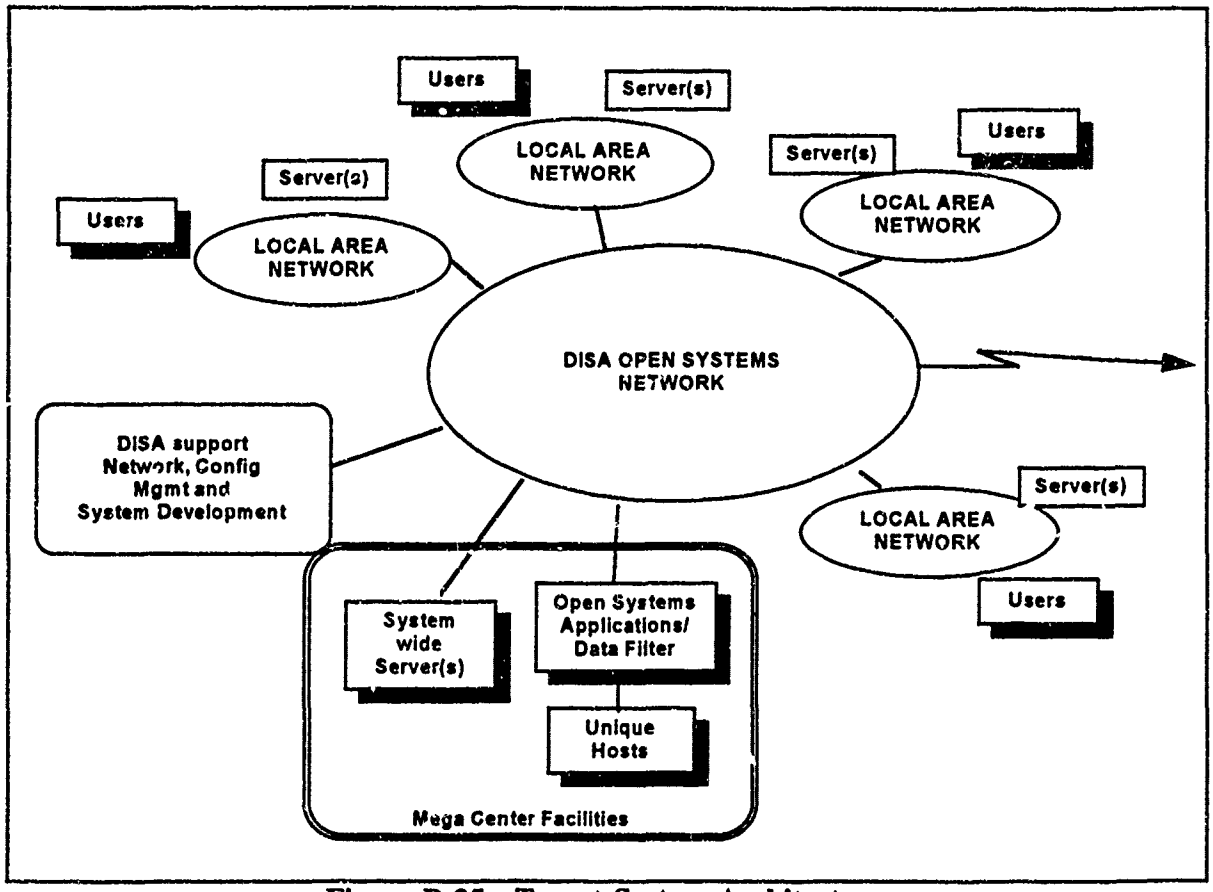

Figure B-25. Target System Architecture

Migration System Analysis. An analysis was completed of the nine systems in general use throughout DoD. Figure B-26 illustrates the results of the initial findings of system functional and technical merit as a migration system platform.

MILDEP System 567 was chosen as the migration system. The primary reasons were:

- Uses an open systems platform.
- The utility fully supports the architecture, so no new unique procurements are necessary.
- Uses DDI-provided migration strategies.

System	Trans	Funct	Tech	Notes
OSD Agency 787	2	50	50	
MILDEP 234	5	70	40	
MILDEP 345	4	30	30	
MILDEP 678	15	60	80	Best overall
MILDEP 567	20	40	95	Best technical
MILDEP 456	7	40	50	
OSD Agency 898	25	80	40	Best functional
MILDEP 789	7	60	50	
MILDEP 123	15	30	10	Worst situation

Trans Percentage of the total transactions handled by the system.
Funct The analyst's rating of the systems capability to satisfy the complete functional requirements including EC/EDI.
Tech The analytical rating of the system's technical currency, i.e., its ability to serve as the open systems platform to support the improved business processes.
Notes Indicates the best and worst systems based on the technical and functional ratings.

Figure B-26. Analysis of Existing Systems

Prototype Critical System Elements. The purpose of this phase is to establish the technical and data environment for the target system. In addition, legacy systems will be connected to the environment to address initial transition issues and permit early transition to open system platforms at individual sites. Actions during this phase will include:

- Establish DISA Utility support.
- Build a rapid prototype of target environment.
- Attach legacy systems to target environment.
- Establish service quality and functional measures program to ensure system targets are met.

Transition Plan. The primary purpose of the transition plan is to separate open systems implementation from separate current system architectures. This will allow early improvements in user capabilities and cost of hardware at individual sites rather than wait for

applications to mature and user training to be completed. It also will introduce incremental transition rather than traditional site-by-site, monolithic styles of implementation.

Legacy systems will be connected to the network with user access via an open systems platform. As each system is successfully connected through the interface, supported sites can commence local transition to the open system. Simultaneously, system support, including training, will be delivered to the workplace.

A timeline for the system implementation is shown in Figure B-27.

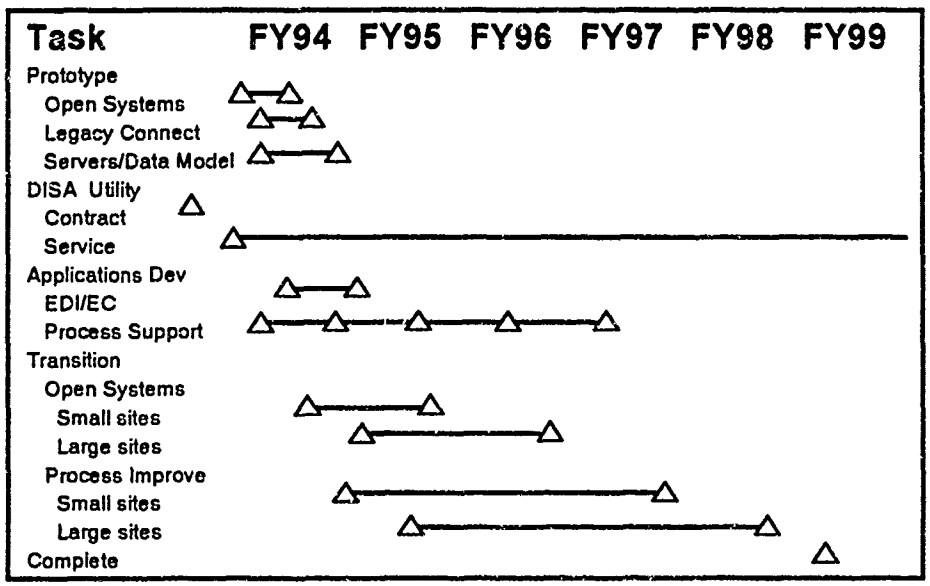

Figure B-27. Implementation Plan

APPENDIX C: FEA Example - The Document

This appendix presents an example of a complete FEA. This example is based on the scenario and input documents discussed in Appendix B. As with Appendix B, the descriptions and data in this example have been developed solely for *illustrative* purposes, and are not intended to represent an accurate portrayal of any DoD activities, organizations, or individuals. In practice, most sections of an FEA would contain more detailed information than is shown here.

Consistent with the scenario, the setting starts with FY 1994. The functional manager for the supply activity has developed this FEA for submission to the Principal Staff Assistant (PSA). The PSA's title is Assistant Secretary of Defense for Supply, Maintenance, and Transportation (ASD (SMT)); the functional manager's title is Deputy ASD for Supply (DASD (Supply)).

Section 1: Functional Area Strategic Plan Summary

The Supply, Maintenance, and Transportation functional area strategic plan outlines the long-term strategies to provide services to the DoD. Four functional activities have been defined for corporate information management (IM) process improvement analysis: supply, maintenance, transportation, and property disposal. Each activity manager has been asked to conduct process improvement projects for their activities and to present functional economic analyses. The target date to begin implementation of recommendations in these FEAs is October 1993.

The strategic plan requires each activity manager to develop long-term approaches to managing their activities and the supporting information resources and information systems. One strategic goal is to participate fully in the corporate IM program, including extensive use of DoD fee-for-service facilities wherever possible, rather than maintaining organic resources to provide like support. Meeting this objective will require close coordination with the appropriate DISA elements on information systems and data management matters.

Several Defense Management Report Decisions (DMRDs) have had an impact on the functional area. The DMRD dollar reductions for each functional activity are shown in Figure C-1.

Functional Activity	DMRD Number	FY94	FY95	FY96	FY97	FY98	FY99
Supply	994	123.4	130.0	147.5	155.0	160.0	165.5
	995	57.0	58.0	58.0	58.0	58.0	58.8
Maintenance	994	183.0	197.1	194.0	192.0	188.0	180.0
Transportation	994	57.0	58.0	59.0	62.0	63.0	63.0
Prop Disposal	997	15.1	20.0	20.0	20.0	20.0	20.0
Total		435.5	463.1	478.5	487.0	489.0	487.3

Figure C-1. DMRD Reductions Affecting Functional Area ($ millions)

The DMRDs will be achieved through efficiencies gained by consolidation and standardization of operations, increased application of technology-based solutions where appropriate, and elimination of unnecessary activities.

DMRD implementation is on schedule, but any delays will have an adverse impact on mission accomplishment. Process improvement projects will provide the means of identifying specific ways to achieve the DMRD-directed cost reductions. Applying corporate IM principles in developing improvement opportunities will ensure that efforts are applied to solving functional problems, including integration with other functional activities, not concentrated on IM.

Section 2: Functional Activity Strategic Plan Summary

The functional activity strategic plan documented workload projections for the supply activity based on input from DoD customers. These projections are stated in terms of the dollar value of sales expected to be processed through the supply system. These workload projections are captured in Figure C-2, which also shows the funding for the supply function contained in the most recent FYDP update. Since the supply functional activity is financed by customer funds through the Defense Business Operations Fund (DBOF), this funding is labeled "DBOF."

Current Funding ($ millions)

	FY94	FY95	FY96	FY97	FY98	FY99
DBOF	2,943	2,890	2,840	2,750	2,700	2,600

Workload Projection (sales -- $ millions)

FY94	FY95	FY96	FY97	FY98	FY99
3,924	3,856	3,793	3,730	3,667	3,604

Figure C-2. Funding and Workload Projection

Supply operations, now and in the future, must satisfy customers' requirements. With the shifting DoD wartime focus from that of major conflict with a single adversary to a wider range of simultaneous regional conflicts, the demands on the supply function will become more challenging in the future. Meeting these requirements will become even more difficult in the face of the shrinking resources shown in Figure C-2.

In order to meet the overall functional activity objective within the prescribed resource constraints, the functional activity strategy calls for action on two fronts:

- Processes must be redesigned to eliminate ineffective, inefficient, and redundant operations. Given the expected joint nature of any future conflict, processes must be standardized across the military departments, and must be integrated from the wholesale level down to the end user.

- The functional activity must capitalize on existing and emerging technologies to complement and support the redesigned functional processes. While paying heed to the uniqueness of military supply operations, the functional activity will make maximum use of new technology and techniques developed in the commercial world.

Section 3: Functional Activity Performance Targets and Measures

Unit Cost. One of the important performance measures for supply operations is funding. Since supply is one of the functional activities for which the OSD Comptroller has specified a unit cost measure, this prescribed measure will be used as an evaluation criteria. The prescribed measure is dollars of cost per dollar of sales processed through the supply system.

Additional performance measures have been established to assess the activity from a more functional perspective. These functional performance measures are order-ship time and direct fill percentage.

Reports on all performance measures will be monitored based on quarterly reports from all sites, in cooperation with the Defense Finance and Accounting Service and other agencies.

Order-ship Time. This is a measure of the responsiveness of the supply system to user requirements, and is the best overall measure of supply effectiveness. Order-ship time is measured in days. The clock starts when the end user submits a request for an item, and stops when the right quantity of the right item has left the wholesale and retail legs of the supply system and is on its way to the right customer. Order-ship time cannot be artificially improved by making partial shipments, shipments of the wrong item, or shipments to the wrong customer.

Measurement: When EDI is available, order-ship time will be measured routinely by monitoring order/receipt transactions. Until EDI is implemented, each site will establish a measurement procedure not to exceed four hours per report; sampling or review of records can be used.

Direct Fill Percentage. This figure represents the percentage of supply requests that are satisfied by direct shipment from suppliers, as opposed to shipments from local commercial middlemen or from wholesale or retail inventories. This measure addresses the efficiency of the system. By using direct fill, the system eliminates one of the links in the supply chain and thus performs more efficiently. Direct fill percentage has recently been added to the list of performance measures for the supply function.

Measurement: The number of items and their dollar value need to be captured for all three fill methods — direct from vendor, local commercial middlemen, and from inventory. Major, one-time purchases over $50,000 should be excluded because they are almost always direct purchase and distort the measure. The data model will capture appropriate information to automate the measure and make the information available upon request; additional reporting is not needed. In the interim, Optional Report 89 contains the total purchases for the requested period. The warehouse number of items and dollar value will be computed

from items transferred from stocks during the period; all purchases to replenish stocks are excluded. Direct wholesale supplier items and dollar value will be determined from contract records, excluding warehouse replenishment. Local retail purchases will be determined based on vendor billing.

To properly gauge the performance of the supply system, the performance measures must be used in concert rather than in isolation from one another.

Objectives. For the unit cost measure and the two functional performance measures, Figure C-3 shows the current level of performance. The latter two were determined from an analysis of AS-IS process models.

Performance Measure	Current Accomplishment
Unit Cost (per dollar of sales)	$ 0.75
Order-ship Time	30 days
Direct Fill Percentage	50%

Figure C-3. Performance Measures

Section 4: Proposed Functional Activity Improvement Program

The process improvement project included a comprehensive review of current business practices in the commercial world. As a result of this review, it was determined that electronic commerce and electronic data interchange (EC/EDI) are being used in an increasing number of commercial operations that are similar to the Department's supply function. In the vast majority of cases, the application of these approaches has resulted in significant improvements in performance, with simultaneous decreases in costs.

Acknowledging that some aspects of military requirements for supply operations are different from similar operations in the commercial sector, the next step in the analysis process was to determine whether elements of commercial EC/EDI approaches would be incompatible with any of the unique military requirements. It was determined that there were no such incompatibilities, and it was therefore decided that the process improvement work would focus on using EC/EDI to improve the supply function.

A number of means of incorporating EC/EDI into the supply function were considered, and two alternatives were developed.

Alternative A: Centralized Procurement with EC/EDI. This alternative calls for maximum use of electronic commerce and electronic data interchange throughout the supply system. Wholesale and retail components of the system would be fully integrated. Contract operations would be consolidated to maximize DoD's considerable buying power.

Alternative B: Local Procurement with EC/EDI. Alternative B implements EC/EDI at the retail level. It would make some use of consolidated buying power, but leave the responsibility for most purchasing at the local level to capitalize on well-established relationships between individual supply centers and local vendors.

Both alternatives call for elimination of non-value added activities imposed by internal and external agencies.

Functional Assessment. An analysis was performed to determine the effectiveness and efficiency of the two alternatives when fully implemented. These projections were compared to the AS-IS or baseline process. The baseline process represents the current process with no changes. The AS-IS and alternative processes were projected against the known workload shown in Figure C-2.

Figure C-4 compares the AS-IS process and the alternatives, using the prescribed performance measures as the criteria. These projections estimate how each of the three processes will perform at steady state. As a further basis for comparison, the current achievement of the AS-IS process is also shown.

Measure	AS-IS Current	AS-IS Projected	Alternative A Projected	Alternative B Projected
Unit Cost (per dollar of sales)	$ 0.75	$ 0.75	$ 0.68	$ 0.74
Order-ship Time	30 days	25 days	10 days	12 days
Direct Fill Percentage	50%	50%	75%	60%

Figure C-4. Steady-State Comparison of Alternatives

It can be seen that either alternative will accomplish the supply mission more effectively and efficiently than will the AS-IS process, with Alternative A outperforming the AS-IS process and Alternative B in all categories. The AS-IS process will generate only modest improvements in performance, and at greater total cost than either of the alternatives.

Details regarding the activity models, cost data, action plans, and other information can be found in a separate document titled *The Supply Activity Functional Assessment*. This document can be obtained from the functional activity manager.

Section 5: Economic Anaiysis of Proposed Alternatives

This section presents the baseline and alternative cost estimates for the Supply Operations function and compares the alternatives with the baseline using the FEA Model.

Baseline Costs. Figure C-5 shows baseline costs for six years, FY 94-99. For each year, the costs are divided into recurring and investment cost categories and, within categories, displayed by cost element.

We projected total costs for the remaining years using adjusted FY94 average costs and expected workloads for FY95-99. The details of these calculations are shown in a cost appendix.

COST ELEMENT	FY94	FY95	FY96	FY97	FY98	FY99
RECURRING COSTS						
Personnel	366.9	357.0	351.1	345.3	339.4	333.5
Info Tech	3.0	6.5	9.9	13.4	16.8	20.3
Facilities	67.2	66.1	65.0	64.0	62.9	61.8
Material	2,332.3	2,295.0	2,257.7	2,220.3	2,183.0	2,145.7
Other	154.2	145.8	137.4	140.4	142.0	142.0
Total	2,923.6	2,870.4	2,821.1	2,783.4	2,744.1	2,703.3
INVESTMENT COSTS						
Personnel	4.0	3.2	2.4	1.6	.8	–
Info Tech	15.1	18.0	21.0	12.5	5.5	–
Total	19.1	21.2	23.4	14.1	6.3	–
TOTAL COST	2,942.7	2,891.6	2,844.5	2,797.5	2,750.4	2,703.3

Figure C-5. Baseline Costs ($ millions)

Alternative Costs. Figures C-6 and C-7 show the estimated costs for Alternatives A and B, respectively. These estimates were developed as follows:

- Personnel Costs. Based on the redesigned processes, new staffing requirements were projected. These manpower requirements were used with average compensation factors derived from the DoD budget to arrive at a total personnel cost.

- Information Technology Recurring Costs. Based on the redesigned processes and the re-engineered supporting AIS and data architectures, quantity requirements for hardware and software were projected. These figures were combined with average costs provided by DISA to determine operating costs. An additional element of information technology recurring costs was the use of the DISA Utility, which will be provided on a fee-for-service basis. This cost element was provided by DISA.

- Facilities/Other Costs. At supply facilities on military installations, facilities costs and most "other" costs are driven by multiplying assigned personnel times the local rate for general and administrative expense. Cost estimates were developed based on the new staffing levels expected to accompany the redesigned processes. At non-military locations, facilities costs consist primarily of rents and leases. These cost estimates were developed based on recent experience and an analysis of projected leasing rates in the concerned geographic areas.

- Material Costs. Material purchasing and handling costs were projected based on the reduced inventory levels and larger orders that will result from the redesigned processes. Additionally, a small reduction in the unit cost of some supply items was projected, based on the larger quantity orders.

- Information Technology Investment Costs. Limited in-house staff effort will be required for the development and implementation of the re-engineered AIS and data architectures, primarily in the area of systems training. These cost estimates were developed based on experience gained during a similar, although smaller-scale, conversion several years ago. The bulk of the investment cost estimate was provided by DISA.

The figures show that both alternatives reduce the costs, relative to the baseline, of meeting the projected workload. Annual savings are estimated to increase over the analysis period as the changes included in each alternative are implemented.

COST ELEMENT	FY94	FY95	FY96	FY97	FY98	FY99
RECURRING COSTS						
Personnel	366.9	355.0	343.0	331.1	319.1	307.2
Info Tech	22.1	21.4	20.7	19.9	19.2	18.5
Facilities	67.2	65.0	62.8	60.7	58.5	56.3
Material	2,332.3	2,256.4	2,180.4	2,104.5	2,028.5	1,952.6
Other	147.3	128.6	121.2	125.3	127.9	129.0
Total	2,935.8	2,826.3	2,728.1	2,641.5	2,553.5	2,463.6
INVESTMENT COSTS						
Personnel	3.2	2.6	1.9	1.3	.6	--
Info Tech	3.7	18.0	21.0	12.5	5.5	--
Total	6.9	20.6	22.9	13.8	6.1	--
TOTAL COST	2,942.7	2,846.9	2,751.1	2,655.2	2,559.4	2,463.6

Figure C-6. Alternative A Cost Estimates ($ millions)

COST ELEMENT	FY94	FY95	FY96	FY97	FY98	FY99
RECURRING COSTS						
Personnel	366.9	362.4	357.9	353.3	348.8	344.3
Info Tech	22.1	21.8	21.5	21.3	21.0	20.7
Facilities	67.2	66.4	65.6	64.7	63.9	63.1
Material	2,332.3	2,286.4	2,240.5	2,194.6	2,148.7	2,102.8
Other	147.3	127.2	118.5	121.2	122.5	122.2
Total	2,935.8	2,864.2	2,803.9	2,755.2	2,704.9	2,653.1
INVESTMENT COSTS						
Personnel	3.2	2.6	1.9	1.3	.6	--
Info Tech	3.7	18.0	21.0	12.5	5.5	--
Total	6.9	20.6	22.9	13.8	6.1	--
TOTAL COST	2,942.7	2,884.8	2,826.9	2,768.9	2,711.0	2,653.1

Figure C-7. Alternative B Cost Estimates ($ millions)

Cost Comparison. RADCF savings were calculated using 14 residual years and a discount rate of 7%. Figure C-8 shows the resulting summary graph from the FEA Model. Alternative A has expected savings over the 20-year analysis period of $1,573 M, as compared with $89 M for Alternative B. The risk analysis shows that, even under worst case assumptions, Alternative A should yield savings. For Alternative B, however, there is a significant probability that costs will actually increase relative to the baseline.

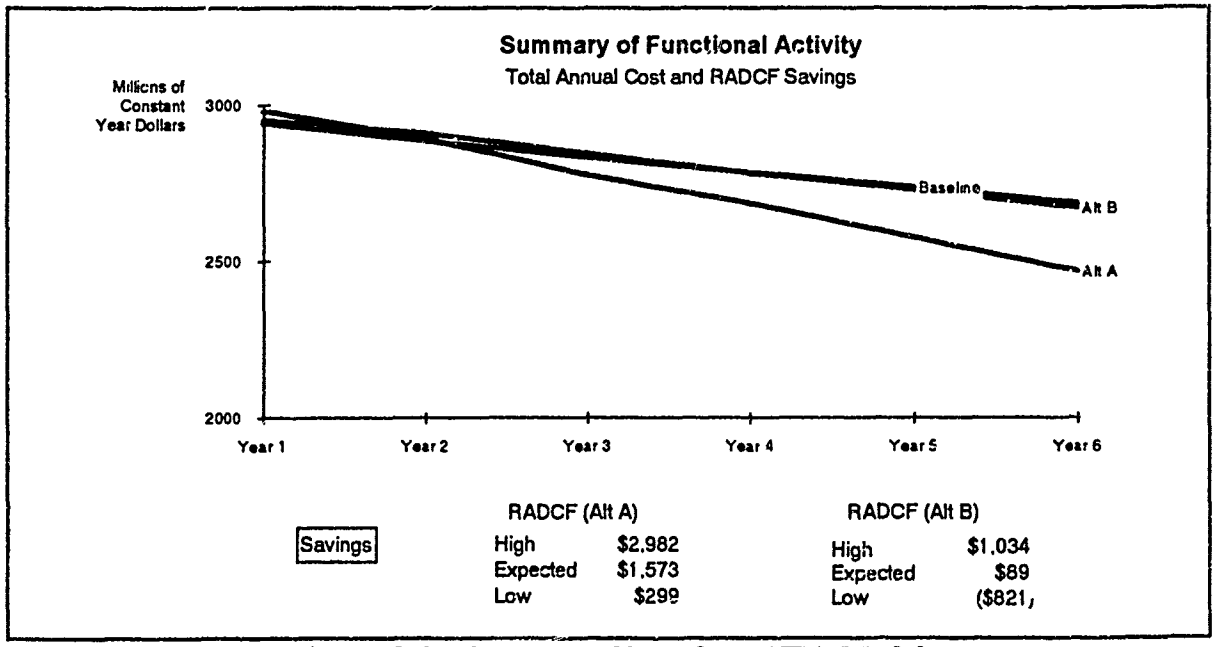

Figure C-8. Summary Chart from FEA Model

Figure C-9 shows the expected tooth-to-tail ratio for the baseline and alternatives in the steady-state. Alternative A increases the ratio of operations to management and support costs for the function relative to the baseline. Because of the nature of the changes proposed in Alternative B, the proportion of operations costs actually decreases compared to the baseline.

Baseline	Alternative A	Alternative B
7.32	7.77	4.82

Figure C-9. Tooth-to-Tail Ratios

Benefits outside the baseline defined for supply operations are also anticipated. Figure C-10 displays these benefits, estimates their value, and shows how they will be measured.

Benefit	Value	Measurement
Facilities Procurement	5% of $600K = $30K/yr	Monitor facilities volume
Transportation Procurement	$260K - one time	Annual audit
Total	$30K/yr $260K - one time	

Figure C-10. Other Benefits

Recommendation. Alternative A meets or exceeds all the objectives for the supply function and provides the greatest expected savings. Recommend that Alternative A be selected.

Section 6: Data Management and Information System Strategy

General Strategy. The general information management strategy for improving the functional process calls for moving directly to the DISA Utility as the source of all ADP services, implementing the data model on an off-the-shelf database management system, focusing all development on migrating existing applications to the data model, and aggressively seeking opportunities to apply new technology where such action is supported by economic analysis.

Migration System Analysis. An analysis was completed of the nine systems in use throughout the DoD supply system. Based on its rich user interface, high degree of compatibility with the DISA Utility, and rapid processing times, MILDEP System 567 was chosen as the migration system. The other systems were found lacking in a number of areas, including reliance on outdated technology and inability to handle multiple types of supply transactions.

Section 7: Data and System Changes

Prototype Critical System Elements. A prototyping phase will be used to establish the technical and data environment for the target system. In addition, legacy systems will be connected to the environment to address initial transition issues and permit early transition to open system platforms at individual sites. During this phase support from the DISA Utility will be established, and a prototype of the target environment will be rapidly developed.

Transition Plan. The primary purpose of the transition plan is to separate open systems implementation from current system architectures. This wili allow early improvement in user capabilities and cost of hardware at individual sites rather than waiting for applications to mature and user training to be completed. It also introduces incremental transition rather than traditional site-by-site, monolithic styles of implementation. It is expected that transitions will be occurring for the foreseeable future, and the transition plan will be adjusted as necessary in order to compensate for unanticipated problems and to take advantage of unexpected opportunities to accelerate the introduction of new technology.

Section 8: Data and System Cost Analysis

Figure C-11 shows the information technology costs associated with the AS-IS process and each alternative. The figure captures both operating costs and one-time or investment costs. Data are displayed in five major categories that identify the life-cycle phases and indicate whether the cost is associated with operational activities or management and support activities.

These system costs are included in the cost overall projections that were used in Section 5 to develop the economic analysis.

ALTERNATIVE	COST CATEGORY	FY94	FY95	FY96	FY97	FY98	FY99
AS-IS	RDT&E (M&S Activities)	--	--	--	--	--	--
	Invest (Opnl Activities)	13.7	16.5	18.2	10.8	4.7	--
	Invest (M&S Activities)	1.4	1.5	2.8	1.7	.8	--
	Opns (Opnl Activities)	2.6	5.7	8.7	11.8	14.8	17.9
	Opns (M&S Activities)	.4	.8	1.2	1.6	2.0	2.4
	Total	18.1	24.5	30.9	25.9	22.3	20.3
Alternative A	RDT&E (M&S Activities)	.8	.8	--	--	--	--
	Invest (Opnl Activities)	6.1	18.3	20.4	12.3	5.4	--
	Invest (M&S Activities)	.3	1.5	2.5	1.5	.7	--
	Opns (Opnl Activities)	19.7	19.0	18.4	17.7	17.1	16.5
	Opns (M&S Activities)	2.4	2.4	2.3	2.2	2.1	2.0
	Total	29.0	42.0	43.6	33.7	25.3	18.5
Alternative B	RDTE (M&S Activities)	.7	.8	--	--	---	--
	Invest (Opnl Activities)	5.7	17.1	19.0	11.5	5.1	--
	Invest (M&S Activities)	.5	2.7	3.9	2.3	1.0	--
	Opns (Opnl Activities)	18.3	18.1	17.8	17.7	17.4	17.2
	Opns (M&S Activities)	3.8	3.7	3.7	3.6	3.6	3.5
	Total	29.0	42.4	44.4	35.1	27.1	20.7

Figure C-11. Cost Details for Data and Systems ($ millions)

APPENDIX E: Discount Factors

	Present Value of $1	
Years in Future	10% Discount Rate	7% Discount Rate
1	0.909	0.935
2	0.826	0.873
3	0.751	0.816
4	0.683	0.763
5	0.621	0.713
6	0.564	0.666
7	0.513	0.623
8	0.467	0.582
9	0.424	0.544
10	0.386	0.508
11	0.350	0.475
12	0.319	0.444
13	0.290	0.415
14	0.263	0.388
15	0.239	0.362
16	0.218	0.339
17	0.198	0.317
18	0.180	0.296
19	0.164	0.277
20	0.149	0.258

Figure E-1. Discount Factors

The discount factors presented in the table above are calculated using an end-of-year (EOY) discounting convention, as shown below. This is consistent with the FEA Model. Calculations for other discounting conventions, such as beginning-of-year (BOY) and middle-of-year (MOY), are also shown below.

$$EOY: \frac{1}{(1+i)^n} \qquad BOY: \frac{1}{(1+i)^{n-1}} \qquad MOY: \frac{1}{(1+i)^{n-0.5}}$$

Where i equals the discount rate and n equals the number of years discounted.

APPENDIX F:

Integration of Functional Economic Analysis with Automated Information System Life Cycle Cost/Benefit Analysis

Recently, there was an OSD effort to integrate FEAs with AIS Life Cycle Cost/Benefit (LCC/B) Analyses. The results are articulated in the following memorandum.

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
WASHINGTON, DC 20301-1800

PROGRAM ANALYSIS
AND EVALUATION

NOV 10 1992

MEMORANDUM FOR THE DEPUTY ASSISTANT SECRETARY OF DEFENSE
(REQUIREMENTS AND RESOURCES), OASD(FM&P)
DEPUTY ASSISTANT SECRETARY OF DEFENSE
(HEALTH SERVICES OPERATIONS)
DEPUTY ASSISTANT SECRETARY OF THE NAVY
(C4I/EW/SPACE PROGS)
DIRECTOR FOR COMMAND, CONTROL,
COMMUNICATIONS, AND COMPUTERS, THE JOINT
STAFF
DIRECTOR OF INFORMATION SYSTEMS FOR C4, ARMY
DEPUTY ASSISTANT SECRETARY OF THE AIR FORCE
(COMMUNICATIONS, COMPUTERS & LOGISTICS)
DIRECTOR FOR ADP SYSTEMS, OFFICE OF THE DOD
COMPTROLLER
DIRECTORS OF THE DEFENSE AGENCIES
DEPUTY DIRECTOR(MANAGEMENT SYSTEMS),
OUSD(A)AP&PI

SUBJECT: Integration of Functional Economic Analysis with Automated Information System Life Cycle Cost/Benefit Analysis

In March 1991, we commissioned a working group to examine the feasibility of integrating the Functional Economic Analysis required as part of the Department's Information Management (IM) program with the Automated Information System Life Cycle Cost/Benefit Analysis (also referred to as Economic Analysis, or EA) mandated by OMB and DoD policies governing life cycle management of acquisition programs. The working group has completed its report and has concluded that it is both feasible and desirable to integrate the two analytic efforts. Several important caveats were forwarded with this conclusion, including:

- First, it is the Department's functional leadership (in most cases, OSD principal staff assistants or those they designate), not AIS program managers who must perform

functional economic analysis. The costs and benefits of the AIS program alternatives developed by an AIS program manager must be included by the functional managers in their larger analytic endeavors.

- Second, FEA has not changed the locus of final decisionmaking authority. As a result, for automated information system acquisition programs, both life cycle cost/benefit (LCC/B) analysis and functional economic analysis must inform and support decisionmaking in the Defense Acquisition System and the Planning, Programming, and Budgeting System. The Department's IM principles state that the user or "owner" of a business process determines the information required to support that process.

The working group's recommendations were reviewed during the meeting of the FEA/EA Steering Group on October 19, 1992. Based on that review, the recommendations of the working group are approved. AIS LCC/B will become an integral part of FEA accomplished by functional managers. Plans for implementing the working group's recommendation to achieve a fully integrated analytic environment are listed at Tab A. As necessary, we will invite your representatives to participate in these follow-on activities.

It is clear from the working group's efforts that the information requirements of Functional Economic Analysis, AIS acquisition program life cycle cost benefit analysis, and planning, programming and budgeting must be integrated to eliminate the confusion and wasted effort caused by multiple meanings assigned to identical terms, conflicting cost element structures, and non-standard data element definitions. We will, therefore, initiate the modeling effort needed to define an efficient, comprehensive, and coherent target data environment. With your cooperation, we are confident that we can achieve our target data environment before the end of Calendar Year 1993.

After the FEA-LCC/B data model is developed and accepted into the Defense Data Repository, an integrated FEA/EA guideline will be prepared, coordinated with your organizations, and included in the appropriate DoD Directives, Instructions, and Manuals. In the interim, the ASD(C3I) will modify the Functional Economic Analysis model developed by the Institute for Defense Analysis to align cost element structures and basic definitions used in AIS acquisition decisions with those used in the Functional Economic Analyses. These changes will support FEA-LCC/B integration during the "migration" period by allowing the AIS LCC/B data to map into the FEA. A description of this mapping is at Tab B. In this way, functional managers developing FEAs will be able to import into those FEAs LCC/B data prepared by AIS program managers. AIS program managers will be able to maintain one set of program management data to meet the needs of LCC/B and FEA, and the FEAs prepared by functional managers can then be used to establish an economic context within which an AIS acquisition makes sense.

We appreciate your support accomplishing the goals of the Department's IM program. Questions or comments on the integration of AIS life cycle cost/benefit analysis and

Functional Economic Analysis should be referred to Michael Yeomans, OASD(C3I), at 746-7932, or to Michael Dominguez, OASD(PA&E), at 695-4295.

C Kendall

Cynthia Kendall
Deputy Assistant Secretary
(Information Systems)

Deborah P Christie

Deborah P. Christie
Deputy Assistant Secretary
(Theater Assessments & Planning)

TAB A

Implementing FEA/EA Integration Working Group Recommendations

Recommendations	Implementation
A. Publish joint FEA/EA policies	Pending
B. Develop common data model for cost structure	Tasking now being finalized
C. Develop single, integrated guideline	Follow-on to 8020.1M and to data modeling effort
D. Integrate FEA support requirements into FPI Support Program	Done
E. Continually refine FPI/FEA process model	Continuing
F. Establish FEA preparation advisory group	C3I/PA&E + others as specific need warrants
G. Brief CFIB/ITPB	Done
H. Prototype FEA efforts	Nominations for prototype programs are welcome. C3I/PA&E will select one or more and begin work

TAB B

Interim Guidance

"Using Life Cycle Cost Benefit (LCC/B) Information in the Functional Economic Analysis Model (FEAM)"

1. Background:

The CIM initiative has changed the focus of information technology support from managing individual automated information systems to using information to improve functional processes. A functional economic analysis (FEA) policy and related model was introduced to emphasize new approach and to assist in functional implementation. A new set of instructions, an 8000 series, has been established to codify new and revised policy and procedures.

Current DoD instructions focus on oversight of major AIS acquisitions based on cost thresholds, patterned after the general DoD systems acquisition procedures. The major AIS review council (MAISRC) provides the oversight through Life Cycle Management (LCM) procedures. PA&E provides independent economic analysis advice to the MAISRC using information prepared by the AIS program manager in compliance with the draft PA&E Life Cycle Cost/Benefit (LCC/B) Guide.

Major component AIS are subject to MAISRC procedures. Funding is justified by plans and economic analyses prepared using the LCC/B. The introduction of the FEA and direct OSD functional manager involvement created overlaps and differences in reporting requirements. The procedures yielded differing results and conclusions, potentially putting programs in jeopardy.

2. Purpose:

a. Provide interim guidance to permit LCC/B AIS acquisition information to be used in the FEA.

b. Integrate LCC/B requirements and procedures in the new 8000 series instructions.

3. Detailed Guidance:

The FEA addresses the full function including baseline, existing AIS support and any new AIS acquisitions. FEA costs and benefits include AIS costs and benefits as a subset. The following procedure permits the LCC/B information addressing the acquisition part of AIS costs and benefits to be used in an FEA presentation.

The attached figure describes the mapping of LCC/B AIS activity costs to equivalent FEA model (FEAM) categories. The left column lists the activities defined and numbered in the LCC/B guide which generally follows weapons system procurement categories. The right hand column lists the FEA model cost categories. Note that the number of FEA model categories has been reduced to simplify understanding and information entry while maintaining visibility of the tooth to tail considerations, the ratio of operations (Ops) to management and support (M&S).

The following general mapping is specified in the figure:

a. LCC/B RDT&E maps directly to FEAM RDT&E, M&S.
b. LCC/B Investment
   - Management activities (e.g., Program Management) map to M&S.
   - Investment costs (e.g., Hardware) map to either Ops or M&S based on how they are used.
c. LCC/B Operations
   - Management activities (e.g., System Management) map to M&S.
   - Operations activity costs map either to M&S or Ops depending how they are used.
d. LCC/B Environment and Disposal
   Considered as investment (LCC/B provides another operations cost category)

LCC/B provides a spreadsheet format to develop totals for investment and operations. These LCC/B costs can support M&S, Ops, or both. The LCC/B does not specify cost elements, leaving the formulation of cost estimates to the program manager. On the other hand, the FEA model defines specific cost elements; civilian labor, military labor, information technology, facilities, materiel, and other. Totals computed using the LCC/B can often be mapped directly into one FEA model cost element, e.g., program management into labor or facilities to facilities. To simplify mapping, investment and operations costs can be computed in separate spreadsheets or single spreadsheet totals can be distributed based on a percentage estimate of the resource split between M&S and Ops. If an estimate is used, the rationale should be described.

4. Summary

Using the above guidance, LCC/B definitions and existing cost information can be used in presenting AIS acquisition data for the overall FEA. Duplicative, conflicting guidance and effort are eliminated. The integrated FEA/EA guidance will be included in the 8000 series instructions, primarily DoD Manual 8020.1-M.

DETAILED MAPPING OF LCC/B COST ELEMENTS TO FEA COST CATEGORIES		
LCC/B COST ELEMENTS		REVISED FEA COST CATEGORIES
Number	Title	Title
1.0	RDT&E	RDTE (Management & Support)
1.01	Program Planning & Management	RDTE (Management & Support)
1.02	Development Hardware	RDTE (Management & Support)
1.03	Development Software	RDTE (Management & Support)
1.04	Development Document/Data	RDTE (Management & Support)
1.05	Development Training	RDTE (Management & Support)
1.06	Development System T & E	RDTE (Management & Support)
1.07	Development Logistics Support	RDTE (Management & Support)
1.08	Dev Facilities Mod/Construction	RDTE (Management & Support)
1.09	Other Development	RDTE (Management & Support)
2.0	INVESTMENT	Investment – see Note 1
2.01	Hardware	Investment – see Note 1
2.011	Processing Units	Investment – see Note 1
2.0111	CPUs	Investment – see Note 1
2.0112	Intermediate Processing Units	Investment – see Note 1
2.0113	Terminal Processing Units (PCs)	Investment – see Note 1
2.012	Peripheral Devices	Investment – see Note 1
2.0121	Printers	Investment – see Note 1
2.0122	Storage Devices	Investment – see Note 1
2.0123	Other	Investment – see Note 1
2.013	Communications Hardware	Investment – see Note 1
2.0131	Wide Area Gateways (Broad Band)	Investment – see Note 1
2.0132	Wide Area Networks	Investment – see Note 1
2.0133	Modems	Investment – see Note 1
2.0134	Local Area Networks (LAN)	Investment – see Note 1
2.0135	Crypto	Investment – see Note 1
2.0136	Other Communications Hardware	Investment – see Note 1
2.014	Other Hardware	Investment – see Note 1
2.02	Software	Investment – see Note 1
2.021	Commercial-Off-the-Shelf (COTS)	Investment – see Note 1
2.0211	Operating System Software	Investment – see Note 1
2.0212	General Administrative Software	Investment – see Note 1
2.022	Application/Mission Software	Investment – see Note 1
2.0221	Contractor Developed Software	Investment – see Note 1
2.0222	Organically Developed Software	Investment – see Note 1
2.023	Communications Software	Investment – see Note 1
2.024	Other Software	Investment – see Note 1
2.03	System Integration, Test, & Evaluation	Investment – see Note 1
2.04	Program Management	Investment (Management & Support)
2.05	Training	Investment – see Note 1
2.06	Support Equipment	Investment (Management & Support)
2.07	Initial Spares	Investment – see Note 1
2.08	Initial Cataloging	Investment – see Note 1
2.09	Initial Data Requirements	Investment – see Note 1
2.10	Site Activation	Investment – see Note 1
2.11	Industrial Facilities	Investment – see Note 1
2.12	Warranties	Investment – see Note 1
2.13	Initial Supplies	Investment – see Note 1
2.14	Engineering Changes	Investment – see Note 1
2.15	Pre-Planned Product Improvement	Investment – see Note 1
2.151	Hardware P3I	Investment – see Note 1
2.152	Software P3I	Investment – see Note 1
2.16	Upgrades	Investment – see Note 1
2.17	Office Furniture & Gen Support Furniture	Investment (Management & Support)
2.18	Data Upload	Investment – see Note 1

DETAILED MAPPING OF LCC/B COST ELEMENTS TO FEA COST CATEGORIES		
LCC/B COST ELEMENTS		REVISED FEA COST CATEGORIES
Number	Title	Title
3.0	OPERATING & SUPPORT	Operations or Investment -- see Note 1
3.01	System/Material/Item Management	Operations -- see Note 1
3.011	System Management	Operations (Management & Support)
3.012	Operating Personnel	Operations -- see Note 1
3.013	Functional Personnel	None -- See Note 2
3.014	Training	Operations -- see Note 1
3.02	Unit/Base Operations	Operations -- see Note 1
3.021	Power Requirements	Operations -- see Note 1
3.022	Facilities Maintenance	Operations -- see Note 1
3.023	Communications	Operations -- see Note 1
3.0231	Leasing/Charges	Operations -- see Note 1
3.0232	System Maintenance	Operations -- see Note 1
3.024	Base Operating Support	Operations (Management & Support)
3.025	Miscellaneous Support	Operations (Management & Support)
3.03	Hardware Maintenance	Operations -- see Note 1
3.031	Contract Maintenance Support	Operations -- see Note 1
3.0311	Processing Units	Operations -- see Note 1
3.0312	Peripheral Devices	Operations -- see Note 1
3.0313	Communications Hardware	Operations -- see Note 1
3.0314	Other Hardware	Operations -- see Note 1
3.032	Organic Maintenance	Operations -- see Note 1
3.0321	Processing Units	Operations -- see Note 1
3.0322	Peripheral Devices	Operations -- see Note 1
3.0323	Communications Hardware	Operations -- see Note 1
3.0324	Other Hardware	Operations -- see Note 1
3.04	Second Dest Transportation	Operations -- see Note 1
3.05	Env & Hazard Mat Store & Hand	Operations -- see Note 1
3.06	Contract Leasing	Included as 2.01 -- See Note 2
3.07	Operations Investment	Operations -- see Note 1
3.071	Replenishment Spares	Operations -- see Note 1
3.072	Fuel & POL	Operations -- see Note 1
3.073	Replen Supplies & Consumables	Operations -- see Note 1
3.08	Software Maintenance	Operations (Management & Support)
3.081	Contract Software Maintenance	Operations (Management & Support)
3.0811	Commercial-Off-the-Shelf (COTS)	Operations (Management & Support)
3.0812	Operating System Software	Operations (Management & Support)
3.0813	General Administrative Software	Operations (Management & Support)
3.0814	Application/Mission Software	Operations (Management & Support)
3.0815	Communications Software	Operations (Management & Support)
3.082	Organic Software Maintenance	Operations (Management & Support)
3.0821	General Administrative Software	Operations (Management & Support)
3.0822	Application/Mission Software	Operations (Management & Support)
3.0823	Communications Software	Operations (Management & Support)
3.09	Parallel System Operations	Operations -- see Note 1
4.0	ENVIRONMENTAL QUALITY	Investment -- see Note 1
5.0	DISPOSAL	Investment -- see Note 1

Notes:

1. These costs will be mapped to Operational Activities or to Management and Support based on the primary resource use. Costs for mission-related use will be assigned to Operational Activities; other costs will be entered as Management and Support. If it is not reasonable to assign costs uniquely to mission-related or support, these costs will be allocated between Operational Activities and Management and Support on a percentage basis; the investment percentage may differ from operations.
2. These LCC/B cost elements are no longer required.

APPENDIX G: FEA Linkage to PPBS

This appendix provides a brief overview of the DoD Planning, Programming, and Budgeting System (PPBS) and discusses how Functional Economic Analyses performed at the OSD level relate to PPBS. The relationship between FEA and PPBS as described here does not apply to FEAs with a lower-level focus, such as those that might be developed at installation level.

The PPBS is the system of policies and procedures that the Defense Department uses to develop and document its mid-range plan, its mid-term resource program, and its near-term budgets. The program and budgets identify the resources, in terms of dollars and manpower,[1] which the Department has decided to apply to its various requirements. While the functional economic analysis is not a formal component of PPBS, there clearly must be a linkage between the two in order to ensure that approved FEAs receive the resources required for implementation.

PPBS Overview

The Department's resource history and projections are captured in the Future Years Defense Program (FYDP), which is the official database of the PPBS. The FYDP is updated at three points in the PPBS cycle, immediately after submission of the following decision documents:

- The Program Objective Memoranda (POM), which DoD components[2] submit to OSD in May or June in alternate years (1992, 1994, etc.).
- The Budget Estimates Submission (BES), which the components submit to OSD in September or October each year.
- The President's Budget (PB), which the President is required to send to Congress each February.

The FYDP projects resource levels into the future for several years. For example, the POMs submitted in June 1992 contained funding data through fiscal year 1999 (FY99). Each time the FYDP is updated, resource projections for all years are updated. Thus, the

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[1] PPBS also addresses forces, such as Army divisions, Navy carrier battle groups, and Air Force wings. However, for most functional managers, forces as a resource are not an item of concern.

[2] DoD components consist of the military departments (Army, Navy, and Air Force), Defense Agencies (Defense Logistics Agency, Defense Mapping Agency, etc.), the Joint Staff, the OSD Staff, and selected unified and specified commands.

FYDP provides an updated snapshot, taken as of the POM, the BES, or the President's Budget, of a future stream of resources.

The Defense Planning and Resources Board (DPRB) is the senior decision-making body for the PPBS. The DPRB is chaired by the Deputy Secretary of Defense and meets to deliberate and decide on resource issues throughout the PPBS cycle. Its principal decision sessions are held to review the components' POMs and BESs.

Using the FYDP

At any point in time, the official funding level for any functional activity is the current FYDP. Although most functional activities are not discretely identified within the FYDP structure, functional managers at OSD level can, by working with DoD components, determine how much funding the current FYDP contains for their functional activities.

A functional manager can use FYDP data in a number of ways. For example, recent historical data can be used to help develop activity-based costs as one of the steps in process improvement. Additionally, after alternative functional processes are developed, they can be assessed for affordability by comparing their dollar requirements to the funding levels in the FYDP. To see how the FYDP can be used, we'll expand on the second example.

Let's consider a typical situation that could apply to any PSA. Assume that a PSA is responsible for three functional activities, and that an FEA has been developed for each of them. Figure G-1 shows the funding and cost data for the three functional activities. To keep the example simple, we're using just three years of data.

Functional Activities	FY96		FY97		FY98	
	FYDP	FEA	FYDP	FEA	FYDP	FEA
Activity 1	800	850	750	750	700	650
Activity 2	1,200	1,050	1,100	1,050	1,100	1,200
Activity 3	500	600	450	500	400	400
Total	2,500	2,500	2,300	2,300	2,200	2,250

Figure G-1. FYDP Funding and FEA Cost Data ($ millions)

The figure represents a snapshot taken at a point in time. The PSA recently approved an FEA for each functional activity. When the FEAs were approved, the projected FYDP funding for each activity was as shown in the FYDP column for each year. The FEA column shows the year-by-year costs of the FEA alternatives that the PSA approved.

The four shaded boxes on the figure are instances where the PSA's approved alternative is projected to cost more than the functional activity has available in the FYDP. In other words, the functional manager doesn't have the money to do what the PSA wants done. Typically, this is what happens at the initial stages of a process improvement, when there are up-front investments required to generate savings in the future. If the PSA tries to deal with each FEA in isolation, this sort of dilemma can be difficult to resolve.

However, by viewing FEAs for all functional activities as a package, the PSA can open up a number of possible solutions. In our example, it's clear that the PSA can solve the funding problem for FY96 and FY97 by reallocating dollars among the three activities. In FY96, funding could be shifted from Activity 2 to Activities 1 and 3; in FY97, funds would be moved from Activity 2 to Activity 3. This would give each activity manager the funding needed to implement the approved FEA.

The situation in FY98 is more difficult. The PSA can reallocate $50 million from Activity 1 to Activity 2 without any adverse impact on Activity 1. But this would only solve half the shortfall in Activity 2, and the PSA's functional area would still be $50 million below the funding level needed to implement its plans. There isn't enough money under the PSA's control, and the PSA cannot reasonably expect that the overall funding level will be increased. Therefore, it's likely that at least one of the functional activities will have to operate with a lower funding level than required by its approved FEA.

This situation calls for the PSA to revisit one of the early steps in functional process improvement. The PSA should reconsider the *functional direction* that was provided at the outset and decide, based on the full range of managerial criteria, which functional activity will have to make up the funding shortfall. When this decision is made, the PSA will issue revised functional direction, and the affected activity manager will go back to work with a requirement to develop a less-costly process improvement.

With this simplified example, we can summarize the PSA's range of options when considering recommendations made in an FEA:

- If the cost of the recommended alternative equals the funding in the current FYDP, the PSA may approve the recommendation (at least so far as dollar constraints are concerned).

- If the recommended alternative in a given FEA requires a lower level of resources than is currently funded, the PSA might be able to apply the dollars to requirements in other functional activities.

- If the recommended alternative requires a higher level of resources than prescribed in the target, the PSA will probably have to issue new guidance, directing the functional activity manager to redo the process

improvement project and the FEA to design the best process that can be achieved within the prescribed resources.

Defense Management Review Decisions

An important element in the resource picture is the ongoing program of Defense Management Review Decisions (DMRDs). From a dollar perspective, each DMRD is a change to previously approved funding levels. Each DMRD applies to a limited number of activities. With rare exceptions, new DMRDs are developed, staffed, and approved in the period of time between the BES and the President's Budget.

There are two key points to keep in mind when regarding DMRDs: (1) the relationship of FYDP to DMRDs and (2) the difference between achieving DMRD reductions and generating savings.

The FYDP and DMRDs. In conducting process improvement and preparing an FEA, the essential thing to know about DMRDs is that the FYDP funding profile reflects the dollar impact of approved Defense Management Review Decisions. If a functional activity has been subjected to dollar reductions by approved DMRDs, the FYDP resource profile will have been appropriately reduced. Even though the functional manager might not have determined exactly how to achieve the DMRD-directed resource reductions, he or she does not need to adjust the FYDP resource profile in order to account for the value of the DMRDs; the dollars have already been removed.

DMRD Achievements vs. Savings. These terms must be used carefully. *Savings* describes a resource reduction that has not yet been removed from the official funding level in the FYDP. *DMRD achievement* describes the extent to which a functional activity has managed to operate at the lower funding levels established by approved DMRDs.

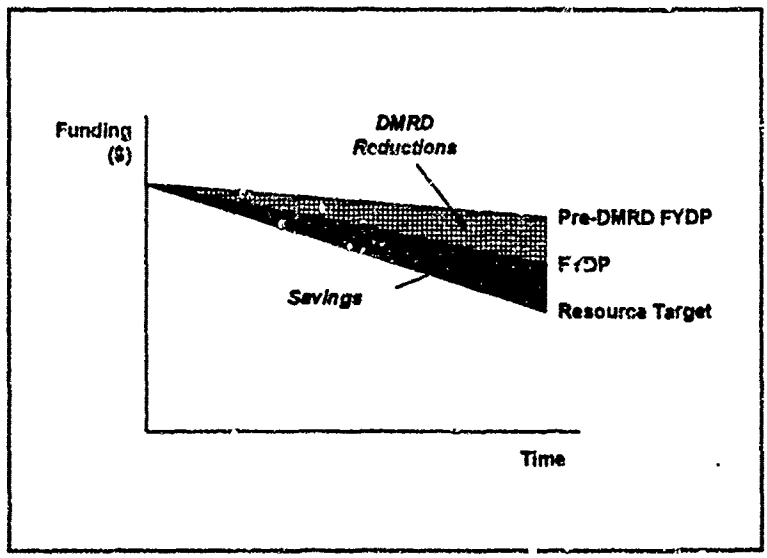

Figure G-2. DMRD Achievement vs. Savings

Figure G-2 helps describe the difference between savings and achieving DMRD reductions. This figure shows funding over time. The pre-DMRD FYDP level represents the funding level before the most

recent set of DMRDs was approved. The shaded area below the pre-DMRD FYDP level represents the resources removed by DMRDs. These reductions resulted in the FYDP level. By successfully operating at the lower funding level, the functional activity will have "achieved" the DMRD reductions, but it should not claim to have generated savings.

The resource target in Figure G-2 indicates that the PSA's guidance calls for the activity to reduce its funding from the current FYDP level. The difference between the FYDP level and the resource target is savings. This means that the PSA is prepared to have these resources removed from the FYDP-funded level for the functional activity.

This difference in terms might seem minor, but it can be significant. By describing DMRD achievements as savings, the functional manager could be sending an unintended message that the functional activity is prepared to give up additional resources beyond those already taken by DMRDs. Thus, care in the use of these terms is recommended.

Using FEAs in PPBS Decision-making

The FEA provides all functional managers with a common frame of reference for assessing the benefits to be derived from process improvements, and the resources associated with those improvements. At any given PPBS decision point, the FEA provides the PSA with material to support and defend the process improvements that have been approved. Armed with this material, the PSA will be prepared to participate effectively in DPRB decision meetings, using objective benefits data from process improvements in order to argue on behalf of the required investments. Such material will be useful in DPRB deliberations, either to support requests for additional resources or to defend current funding levels.

Comments

The FEA Guidebook is intended to be a living document that will be updated as concepts, methodologies, and software tools evolve, and as comments are received from our readers.

Please photocopy this page as necessary; and send or FAX it with your name, address, date, and comments to:

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